Faculty of Computer Science & Information Technology

MALAYA UNIVERSITY

WXES 3182: Project Ilmiah Tahap Akhir II

Program for PDA

Educational Organizer

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Abstract

PalmForce Organizer system is a PDAs based system aimed at helping the PDA user to manage their daily operation or work. The purpose of PalmForce is to integrate all the useful organizer such as financial organizer, health organizer, personal organizer and educational organizer into one package so that the user won't have to look for the four types of organizers. This system provides user a very convenient use as with this system, the user can plan for their educational information, financial information, personal information and health information in just one system.

The prototype model approach is selected for the development of PalmForce. This method is adopted because simple and ease of implementing. In addition, testing is performed in every stage and it may provide a chance to enhance the previous version of the product in every phase. Through the system development life cycle, system methodology is adopted to understand the current problem situation. Careful analysis and research has been conducted to determine the feasibility of the system and what is required of it. The system requirements are identified, translated into design and finally implemented via coding. The finished system is evaluated to meet the system objectives and requirements specification.

Practically, the PalmForce is program using J2ME technology and developed on Microsoft Windows XP Professional platform. The development tool is Borland JBuilder 9.0.

Table of Contents

Chapter 3: Software Development Methodology

Chapter 4: System Analysis

Chapter 5: System Design

Chapter 6: System Implementation

Chapter 7 : System Testing

Chapter 8: System Evaluation

List of Figures

List of Tables

Chapter 1
Introduction

1.1 Project Overview

As time goes by, more and more people own PDAs in order to organize their daily operation/work. There are so many things we need to do in one day if we didn't arrange and organize our work properly we will easily get mess up with our packed work, especially for the student. Nowadays student's homework and assignment are become more and more compare to old days.

But luckily with fast progress of technology, people tend to use the machine to help people to organizer some of the things so that people will free up some time to do other important things. This is because person has only 24 hours, one person can't manage so many things in a day, there is a limit for a person to do their work. So for now, people are more likely to use computer to help them organize the daily work so that they can finish their on time.

In the old days, people tend to organize all their things in paper although it's did help a lot compare to not organize the things at all. But there is some problems encountered during paper organize because sometimes if we get too many work we will get confused of so many works.

And, there will be some conditions where people cannot find the document that they need just because of so many documents fail that have been kept before. The more documents we keep the more difficult we want to find the fail that we want. But for now, we won't rely on the paper organize environment anymore. Most people already shifted

to computer based organizer since computer is become more and more popular now. Almost every family has at least one computer. Besides that, computer can handle more work compare to paper.

And, it's far more simple and easy to manage as we just need to insert the data into the organizer system in the computer then the computer will automatically arrange the timetable and the schedule for us. This is far more convenient compare to the old days that we tend to use the paper to organize everything. After the computer age, here comes a new era where people no more using the computer to organize their daily work as we can't bring along the computer all the way. So, PDAs were introduced to the public in 1996 where it appears to be a smart organizer for many people with it size compatible to a mobile phone or maybe slightly bigger. PDAs today come with powerful processors and considerably large memory. They can work for long hours before their batteries are empty. Therefore the people can demand more functionality from the PDA software vendors today.

Most people use PDA as a gadget to store needy data and schedule their daily life, as they did with their note books before. Programs called organizer are developed to suit the users need. Organizers nowadays mostly have basic functions as below:

- As a reminder for the user. User can store the activities that need to be done in the PDA and set it to alarm the user when the time comes. Calendar is available for user to use too. User then can plan their daily schedule easily.

- As a contacts storage. Address book is a very useful tool for those that has a lot of connections with people, especially businessman. Address book in the PDAs not only store the data but also arrange them in index so that the user can browse through them easily, even if the list contains over 100 names.
- As a small accessory tool. Organizer comes with some small useful tools for users to use in their daily life too, such as alarms, calculator etc.

So, here we come the idea of building a complex organizer system which combine four useful organizer (financial, personal, health and educational) into one powerful organizer system that can be used in palm. This is because most of the organizer system available today in the market is separate into standalone financial, personal, health and educational organizer. Why we want to apply for the four organizers in four times since we can combine four of them into one powerful organizer. So, here is the PalmForce organizer system which has four major organizer functions inside.

1.2 Project Objective

The objective of this project is to provide the whole complete package of organizer used in palm which include the four major organizer (financial, health, personal and educational) into one. User cans organizer different things like financial, health information, personal information or educational information which is useful for student in just one tool. This tool is able to save a lot of time and energy as the user can choose to organize so much of work in just one system thus provide a far more convenient way to organize their daily work compare to other organizer.

Besides that, this project also tends to practice a paperless environment for the user as during the old days. All people are using the paper to organize their daily work. Now the situation is not the same as we can use the PDAs to organize our daily work.

And, this project also tends to provide the useful and specific organizing method for the PDAs users. Some of the modules or functions in the project may help the users to manage different work according to the user's need. So the user can choose for doing anything based on the modules and functions that have been provided to the user through this project.

Moreover, this project also tends to provide a more convenient and easy way to manage and store their personal information into the PDAs in a more secure and effective way. As we know, if we have too many work to manage there may occur a situation where we may overlap some of the work. So with the help of organizer system, this won't

happen anymore as the system will automatically eliminate the duplicated data and thus help the user to synchronize the data inside the organizer. This provides a faster and secure way for user to manage the information they need.

1.3 Problem Domain

As we have been discussed before, there are many ways to organizer the information. One of the most common way to store data is using the paper but that's consider out to date already since now is the time we all shift to use computer as computer did help a lot in organizing compare to paper. Computer can manage so many data and those data can be saved in one diskette compare to the paper where we may have to use a huge amount of paper to store just a few data.

And, getting to use a book to organizer all the things may seem to be not ideal as we can't bring along all the book that keep the information that we need. So the PDAs are the right choice for us to keep our information. As it is small and we can bring it along to where we go. This enable us to use it in 24 hours a day compare to the paper where if we wish to refer back to the information before we have to go back to office or other place which keep fail to search for that information.

1.4 Scope and limitations

1.4.1 Scope of the project

The development of the system is focused to the PDA users, regarding their profession, and provides sufficient methods specifically tailored to their usage. The scope that will be covered by the educational organizer system is listed below:

i. Allow the user to schedule study time and arrange their timetable

ii. Keep and analyze the user exam result

iii. Provides a template folder for the user's to store educational information

iv. Allow the user to keep track of their teacher, lecture, or classmate in a more efficient way

v. The system will only support English as a single communication language. All the information provided will be in English.

vi. Each module will only develop the basic functions such as manage assignment and so on.

Targeted user:

i. Student from university/college/school

ii. Working group

1.4.2 Limitation

This project carries some of the limitations as followed:

i. There is a limitation on the database size. The database cannot be too large because the memory size in the PDA is very limited.

ii. The PDA usually uses the slower processor in order to cut down the cost of PDA. So, the data may process in a slower speed compare to the PC.

iii. The screen on the PDA is much smaller than the PC. So, the user may have limited control on the user interface.

iv. Data export from the database cannot be read from the PC.

1.5 Expected Outcome

The expected outcomes for the educational organizer is as followed:

i. A system that can be use to manage student related information such as lecturer, teacher and subject information.

ii. A system that can be use to help student schedule their timetable, for example, a timetable that will keep reminding student about what they need to revise or do in a particular day.

iii. A system that can be use to help student schedule their project and assignment so that they can handle their project in a more efficient way.

iv. A system that can be use to help student to keep track of their own study material such as book and notes which provide them an easier way to do revision.

1.6 Project Schedule

A project schedule describes the software development cycle for a particular project by enumerating the phase of a project and breaking each of the phases into discrete tasks that need to be carried out. It is essential as it acted as a time management and control to the developer to determine what tasks to be carried out and what goals should be achieved when a certain milestone is met. The project schedule is as shown in **Error! Reference source not found.**

ID	Task Name	Duration
1	Preliminary Study and Planning	14 days
2	Literature Study	25 days
3	System Analysis	35 days
4	System Design	30 days
5	Prototyping	14 days
6	Development and Coding	84 days
7	Unit Testing	30 days
8	System Testing	25 days
9	Implementation and Maintenance	20 days
10	Documentation	217 days

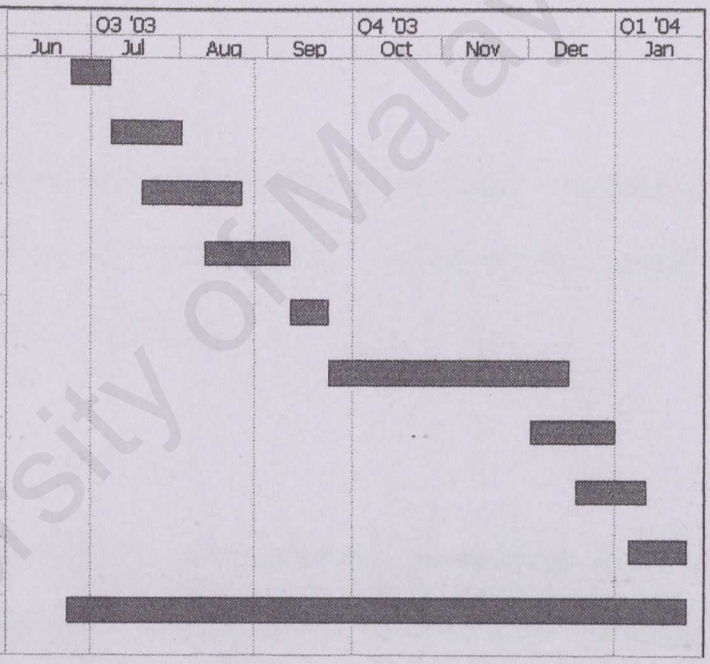


Figure 1.1Project Schedule

1.7 Report Summary

The purpose of the report layout is to give an overview of all the phases involved during development of the project. This report consists of eight chapters. Below is the report layout:

Chapter One: Introduction

This chapter is an introduction of the project overview, statement of problems, project objectives, project scopes, expected outcome and project schedule.

Chapter Two: Literature Review

This chapter carries out the research before the project can be implemented. It consists of domain studies and technology review where research and analysis on the currently available system and techniques used are carried out.

Chapter Three: Methodology

This chapter emphasizes on the conclusion on development methodology and the justification of the chosen methodology. It also discusses the information gathering methods and the explanation about the development tools and technologies chosen to develop this system.

Chapter Four: System Analysis

This chapter describes the system analysis that contains the requirements needed such as functional requirement, non-functional requirement, and hardware and software requirements.

Chapter Five: System Design

This chapter explains the conceptual and technical design of the system which covers the system architecture design, system functionality design, database design and interface design.

Chapter Six: System Implementation

This chapter explains the implementation of the system. It discusses on the system development that convert the modules and algorithm that have been designed into programming language that can be implemented

Chapter Seven: System Testing

This chapter presents various type of system testing to find system error and fault. This is also important to make sure that the system fulfills the requirements and specifications that have been planned.

Chapter Eight: System Evaluation

This chapter presents the system evaluation that reveals the problem encountered and solutions, system strength and limitation, future enhancements and others.

1.8 Chapter Summary

This chapter focuses on the introduction of the proposed project, PalmForce. Overview of PalmForce is explained at the beginning of this chapter. This chapter also covers statement of problem, project objective, project scope, expected outcome, project schedule and report summary. The duration for this project that includes research and development will take about 8 months.

The next chapter gives brief explanation on topics researched and studies that are relevant to this project. It is the combination between literature search and literature review about tools and technologies.

Chapter 2
Literature Review

2.1 Important of Literature Review

This chapter strives to address, in a systematic approach, the review of literature works in various topics performed in the scope of the undertaken thesis project. Undeniably, a review of literature is essential in uncovering knowledge required before decisions are made upon certain aspects of the project.

Literature review is a careful examination of a body of literature pointing toward the answers to the questions directly or indirectly imposed by the project title. A body of literature is a collection of published research relevant to the research questions.

Most of the time, literature review is perceived as being a separate and discrete stage isolated from the project process. This is based on the assumption that the review only plays a role at the start of the research project. The objective now is to make the review an integral component of the whole project by devising steps and mechanism to approach the review in a systematic and rigorous way. The result of this would be literature survey results that are thorough and reliable, and then can be used in systems analysis, design, system implementation, testing as well as during maintenance phase.

A literature review of this project is important as it places the project in the context of others, which might have similar characteristics. It helps the developer to know some of the existing features offered by a similar system.

There is no use of reinventing the wheel that has already been invited. The developer can rather focus on learning the existing system and modify or enhance it into a more powerful feature of project.

Another important purpose of a literature review is to sufficiently equip the developer with some knowledge of the strengths and limitations of several development tools. This can help the developer to choose the right tool to develop the system.

To achieve the above objective, several key steps are adapted. These are distinct but related steps involved in undertaking a review that should be followed in sequence and which produces output in tangible form.

The key steps are:

- Clarification of the purpose of the literature review in the form of rationale statement;
- Planning the review through drawing up of a blueprint document;
- Conducting a comprehensive literature search, according to the blueprint;
- Selection and focused reviewing of individual items, according to the blueprint, creating a set of individual reviews;
- Integrated or 'synthesis' reviewing, according to the blueprint, to produce the review document.

For this project, literature-reviewing serves the purpose of gathering information related to the development of palm based organizer system. The review will focus on the latest theoretical developments in palm organizer system from a global point of view. The result of the review shall serve to better equip the developer with knowledge relevant or essential in the design and planning of the system.

2.2 Palm

Palm, Inc., a pioneer in mobile and wireless Internet solutions and the world leader in handheld computing, was founded in 1992. It was acquired by U.S. Robotics Corp. in 1995. In 1996, Palm introduced the Pilot 1000 and Pilot 5000 products that led the resurgence of handheld computing. In June 1997, Palm became a subsidiary of 3Com Corp. when U.S. Robotics was acquired by 3Com. With its acquisition of Smartcode Technologie in February 1999, Palm added advanced wireless communications capabilities to the Palm OS® platform to address the market for mobile information appliances, such as cellular telephones, messaging devices, data communicators and smart phones. In September 1999, 3Com announced plans to make the Palm subsidiary an independent, publicly traded company. In September 2002, Palm signaled a new era in handheld computing with the creation of two distinct sub-brands for its portfolio of handheld products - the Tungsten™ and Zire™ families. Tungsten products provide powerful solutions for mobile professionals and enterprise work forces; Zire handhelds provide affordable options for consumers to organize their busy lives.In 2002 Palm accounted for 41.4 percent of the worldwide pen-based handheld market, according to IDC.* Today, the Palm OS runs on almost two out of every three handhelds, and more than 85% of businesses include the Palm OS on their handheld standards lists. Palm products are sold in more than 48 countries and through Internet retail websites.*IDC – Pen-Based handhelds starting 2001; before that, personal companions; for 2002 Palm Solutions Group share calculated share of pen-based market only.

Palm handhelds are the standard in handheld information management for companies of all sizes, enabling employees to access instantly the information they need to make more informed business decisions. Palm is the handheld market leader in areas such as mobile business, healthcare, education and government and will continue to extend that lead by delivering compelling business and enterprise mobile information-management solutions, business-focused hardware and software products, robust service and support, and innovative market-leading alliances with developers and solutions providers.

Palm continues to build strategic relationships with partners that are aligned with the vision of delivering easy, secure, mobile solutions for business. As an example, Palm's relationship with IBM and IBM 's WebSphere Everyplace Access, is meeting the demand of customers wanting secure access to enterprise applications and data on Palm handhelds.

The popularity of Palm handhelds among students and teachers is quickly growing on college campuses and in primary and secondary schools around the world. Palm handhelds offer students and teachers simple, quick, fun and smart ways to communicate, learn and teach wherever they go. With a Palm handheld, a teacher or student can do amazing things: take notes, read books, calculate, sketch ideas, collect data, access resources, manage activities and courses and instantly beam information.

2.2.1 Palm Design Philosophy

i. Simple - There must be no complicated steps between user and user's information. User doesn't have time to fumble with confusing menus and hourglass cursors. On a Palm handheld, just touch the Date Book icon and user're on today's agenda. One touch to the scroll button and user see tomorrow's.

ii. Wearable - Handhelds need to be carried everywhere, so users can get to their information anytime. They must be light and small enough to slip into user pocket or purse without thought.

iii. Expandable - Feature overload diminishes battery life, adds additional costs, and compromises the wearability and usability of handhelds. The philosophy is simple. Start with the basics, make them affordable, and let customers add functionality as they see fit.

iv. Mobile - Palm handhelds are designed to make it easy for user to access their important information no matter where you are or where that information is - on user's desktop, on the company server, at home, or on the Web. The Palm VII™ handheld was the industry's first handheld with built-in wireless connectivity to the Internet and intranets combined with easy, out-of-box account activation. Add-on wireless modems are available for other Palm handhelds.

2.2.2 Palm OS

Palm OS is an operating system made by PalmSource, Inc. for personal digital assistants (PDAs) manufactured by Palm, Inc. and other companies. The Palm OS was designed to provide Palm units with basic functions such as handwriting recognition,

display control, and interface standards. Palm PDAs typically come with several basic productivity applications, such as: Address, Calculator, Date Book, Expense, Memo Pad, Note Pad, To Do List.

2.2.3 Pocket PC

Pocket PC is another version of PDA that is getting more popular among the PDA users. Pocket PC is a software that includes operating system and useful application components in a package. Developed by Microsoft, it is aimed at providing easy-to-use interface and multimedia features. It includes a bundle of components from Microsoft CE, which is a set of OS components used by OS developers to build custom OS, and application components, such as Media Player, MS Pocket Internet Explorer, MS Pocket Word, MS Pocket Excel and MS Pocket Outlook.

2.2.4 Symbian OS

Symbian's advanced open standard operating system for data enabled mobile phones. It includes a multi-tasking multithreaded core, a user interface framework, data services enablers, application engines and integrated PIM functionality and wireless communications.

Symbian OS is designed for optimal flexibility, giving mobile phone manufacturers broad scope for differentiation and innovation in user interfaces, hardware designs and connectivity.

The flexibility of Symbian OS allows handset manufacturers to pursue innovative and original phone designs. This white paper focuses on several key aspects of Symbian OS that make it the optimal choice for a mobile phone platform. It addresses engineers questions about Symbian OS software architecture, integration of peripheral hardware, porting and customization and application support.

2.2.5 Comparison between Palm OS and Pocket PC

i. Price - Palm OS devices tend to be cheaper than Pocket PCs. Palm OS devices such as the Zire and Sony SJ20 are cheaper because they have lower quality displays, slower processors and less memory than Pocket PCs. That doesn't mean they're slow, rather the Palm OS is a highly optimized and low frills OS that doesn't need much horsepower to run.

ii. MS Word and Excel - Pocket PCs integrate with MS Word and Excel. OS doesn't have built-in Word and Excel support. However, there are some great 3rd party Office programs available that do let you work with Word and Excel files. Documents To Go is a popular Office suite for Palm that's bundled with nearly all non-entry level Palm OS PDAs.

iii. Management, calendaring and to-do lists - Both handle contact management, calendaring and to-do lists quite well. But Palm OS PDAs is better for these tasks because it takes fewer clicks to get to the info user need.

iv. Size and weight - Generally Pocket PCs are larger and heavier than Palm OS devices.

v. Battery life - Pocket PCs have rechargeable lithium batteries that last around 3 hours of actual use per charge while most Palm OS PDAs which can run 1 or 2 weeks per charge.

vi. Simplicity – Palm OS is more easy to use compare to Pocket PC.

vii. Handwriting recognition and on screen keyboards - Both Palm OS and Pocket PC PDAs have handwriting recognition and on screen keyboards too.

2.3 Programming Language

2.3.1 Java

The java programming language and environment is designed to solve a number of problems in modern programming practice. It starts as a part of a larger project to develop advanced software for auditor. These devices are small, reliable, portable, distributed, real time embedded system.

The java programming language is a high level language that can be characterized as simple, object oriented, distributed and interpreted, robust, secure, architecture neutral, portable, high performance, multithreaded and dynamic.

User can either compile or interpret a program to run it on the computer with most programming language. The java programming language is unusual in that a program is both compiled and interpreted. The compiler, first translate a program into Java bytecodes the platform independent codes interpreted by the interpreter on the java platform which act an intermediate language. The interpreter parses and runs each java bytecodes instruction on the computer. Compilation happen just once while interpretation is occurred each time the program is executed.

Java bytecodes is the machine code instructions for the JVM (java virtual machine) JVM is every java interpreter, whether it's a web browser or a developed tool that can run applets. Java bytecodes enable possibility 'write once, run anywhere', the program can be compiled into bytecodes on any platform that has a java compiler. The bytecodes can then run on any implementation of the JVM. This capability enable the same program written in Java programming language can run on Solaris workstation, an iMac or Windows 2000 as long as the computer has a JVM.

The Java platform runs on top of other hardware-based platform, which differs from most other platforms in that it's a software-only platform. The Java platform has two components: the Java Virtual Machine (JVM) and Java Application Programming Interface (API). JVM is ported onto various hardware-based platforms and is the base for the java platform. The java API is a pool of ready made software components. Many useful capabilities such as graphical user interface (GUI) widgets and so on are provided.

The most common types of programs written in the java programming language are applications and applets. An applet is a program that adheres to certain conventions that allow it to run within a java-enabled browser. The applet displays an animation of the java technology's mascot.

An application is an independent or standalone program that runs directly on the java platform. A special kind of application is known as a server supports and serves clients on a network. Examples of servers are proxy servers, web servers, mail servers and print servers.

Another specialized program is a servlet, which can be thought of as an applet that runs on the server side. Java servlet are enable user in replacing the use of CGI script and building interactive web applications. The servlet are similar to applet in that they are runtime tailoring the server rather than working in browser.

API is building with package of software components to support all these kind of programs. The following feature is existed in every full implementation of the java platform:

i. The essentials: objects, input and output, strings, threads, numbers, data structures, system properties, date and time and so on.
ii. Applets: the set of conventions used by applets
iii. Networking: URLs, UDP (user datagram protocol) sockets, TCP (transmission control protocol), IP (internet protocol) address.
iv. Internationalization: help for writing programs that can be localized for users worldwide. Program can be displayed in the appropriate language and automatically adapt to specific locales.
v. Software components: known as javabeans, can plug into existing component architectures.
vi. Object serialization: allows lightweight communication and persistence via remote method invocation (RMI).
vii. Java Database Connectivity (JDBC): provides uniform access to a wide range of relational databases.

2.3.2 C++

C++ was initially designed and implemented by Dr. Bjarne Stroustrup at AT&T Labs (then AT&T Bell Labs). The first commercial release happened in 1985. The language gained widespread use in industry and academia during the 1980s, and around 1990 the major computer and software tools suppliers started to provide C++ to their users as a major implementation tool. After explosive growth of the C++ user population in the 1980s and early 1990s where C++ usage doubled every 7.5 months, the use of C++ has settled into a pattern of steady growth (on the order of 15% to 30% a year). The new standard is expected to sustain and stimulate this growth. The number of C++ programmers worldwide is estimated to be more than 1.5 million. More than 400 books are currently in print about C++ programming.

2.3.3 Reason to choose Java

Java programming language is used in developing my system because:

i. It requires less effort than other languages and likely to make program better.

ii. Get started quickly – it's easy to learn, especially for those already familiar with C or C++

iii. Write less code – a program written in the java programming language can be four times smaller than the same program in C++ if compare of program metrics (class counts, method counts and so on)

iv. Write better code – the java programming language encourage good coding practices, and its garbage collection avoid memory leaks. It objects orientation, its wide ranging, its javabeans component architecture and easily extendible API enables reuse other people's tested code and introduce fewer bugs.

v. Develop programs more quickly – the development time may be as much as twice as fast versus writing the same program in C++.

vi. Avoid platform dependencies with 100% pure java – the program can be kept portable by avoiding the use of libraries written in other languages.

vii. Write once, run anywhere – its platform independent because it compiled into machine-independent bytecodes. They run consistently on any java platform.

2.3.4 J2ME

As time and technology moved on, Sun recognized the need to collect the device-oriented platforms under one umbrella. At JavaOne in 1999, Sun introduced the Java 2 Micro Edition. J2ME is not a specific virtual machine, API, or specification. Instead, J2ME provides a modular, scalable architecture to support a flexible deployment of Java technology to devices with diverse features and functions. A J2ME "configuration" targets devices with a specific range of capabilities. A "profile" selects a configuration and a set of APIs to target a specific domain of applications. By selecting the best configuration and profile, a vendor can produce a wide range of flexible applications. Since lightweight appliances do not need to support the entire Java 2 platform, their resource requirements (and therefore cost) will be reduced. At the same time, by allowing modular extensions, J2ME allows vendors to differentiate themselves by producing innovative applications and incorporating value-added features.

2.2.4.1 J2ME Configurations

A J2ME configuration defines an API and a virtual machine optimized to service devices that fall into a particular range of capabilities and resources.

Two configurations have been defined, the Connected, Limited Device Configuration and the Connected Device Configuration. At this time, there is no configuration for disconnected devices.

The Connected Device Configuration expects devices with substantial resources. In particular, it requires at least 512K ROM and 256K RAM, and a device that can support a complete JVM implementation.

The Connected, Limited Device Configuration provides a platform for more resource constrained, but still network-connected devices. (The network connection may be intermittent.) It specifically requires:

- 128K to 512K total memory available with <= 256K ROM/Flash and <= 256K RAM. In most cases devices will have more ROM than RAM or Flash memory.
- Limited power, often battery operation.
- Connectivity to some type of network, although with possibly limited(9600/bps or less) bandwidth.
- User interfaces with varying degrees of sophistication down to and including none.

This category of device includes cell phones, two way pagers, and PDAs.

2.2.4.2 J2ME Profiles

Profiles define additional class libraries and APIs needed to enable domain-specific applications on a particular configuration. Profiles provide the vertical specialization built upon the horizontal configurations. For instance, the Mobile

Information Device Profile requires at least the Connected, Limited Device Configuration. It enables development of applications to provide wireless access to information.

The most basic profile is the Foundation Profile. The Foundation Profile requires the Connected Device Configuration. It explicitly supports devices with no user interface whatsoever, but which do have networking support.

2.2.4.3 The 'K' Virtual Machine

Sun has introduced a new Java virtual machine to support J2ME on 16 or 32 bit microcontrollers. Aimed at the Connected, Limited Device Configuration, the KVM is only 40K of object code and needs only "a few tens of kilobytes" at runtime. A KVM developer's release is available from the Java Developer's Connection (see Resources below.) This early release runs on 3Com's PalmOS v3.01 and higher. The distribution includes documentation, the KVM class library, and tools to package and install Java applications on PalmOS-based devices.

Advantages of KVM:

KVM is small. Really, really small. In its tightest configuration, it requires only about 40 kilobytes. It can also be customized. Several Java language and virtual machine features not required by most applications have been made optional. A particular J2ME configuration defines which of these optional features must be included in the KVM implementation. The follow features are optional:

- Long, float, and double

- Multi-dimensional arrays
- Class file verification
- Recoverable handling of Error classes
- Threads
- Event Handling
- JNI
- Class loaders
- Finalization

If user installs the developer's release of the KVM, user will see that some of these optional features are included in this implementation. Future configurations are likely to support some of the rest. One of the goals of the KVM was to support incremental deployment of J2ME features, so a future KVM implementation should allow selection of these features.

Disadvantages of KVM:

The KVM weaknesses are directly connected to its biggest strength. In order to make it so small, Sun made some compromises in the Java language and virtual machine. This seems to be the long-feared fragmentation of the Java hegemony. Programming Java for J2ME is not like programming desktop Java or enterprise Java. More than even, it will be practically impossible for a developer to keep current on "Java Technology" as a whole. Specialization will be more necessary in the future. (Remember this when hiring!)

Watch out for this one: The KVM does not implement the Java Virtual Machine Specification! It implements a subset of that specification. What does this mean? Well, first of all, do not expect WORA in all J2ME applications. A smart phone application will be extremely unlikely to work on a PalmPilot, or vice versa. This seems like it should be obvious, since the two devices have totally different capabilities, but since portability has been so much a part of the Java message, it pays to note its limitations under the J2ME. In general, J2ME applications will be portable across the profile they were designed for. In many cases, an application will also be portable from one profile to a more capable profile.

2.2.4.4 Future of J2ME

J2ME is still very new and much of the platform is evolving. A lot of specifications remain to be written. Sun and its partners will define the future of J2ME together via the Java Community Process. Through the JCP, members will jointly define new profiles and configurations. One area of hot interest is real-time embedded Java.

Jini is conspicuously absent from J2ME at this point. Sun acknowledges that Jini is absolutely essential. Expect to see Jini support in a forthcoming version of the KVM. It is also likely that the Community Process will result in a new J2ME profile for a Jini-enabled device.

The future certainly has more J2ME devices in store. Obviously any PalmOS licensee will be able to use the KVM. Sun is also aggressively pursuing other partners, like Motorola and NTT DoCoMo.

Support for J2ME is widespread, but not universal. IBM has their own JVM for embedded devices, called J9, that does not support J2ME. There are other, non-J2ME embedded virtual machines available, such as CrEme from NSIcom. Nevertheless, it is likely that J2ME compliance will rapidly become a must-have feature for embedded Java.

2.4 Integrated Development Environment (IDE)

2.4.1 JBuilder

Jbuilder is a Borland Java Compiler product. Its true triple-platform development system is the most important thing about it. It will run, from the same CD on Linux or Solaris and Windows. It also supports three application servers – websphere, webLogic and Borland's Appserver. Furthermore it also support three version control systems – visual sourcesafe, CVS and clearcase. The most impressive part of this versatility is the fact that JBuilder installed without trouble using InstallAnyWhere, earlier versions of, which have found it difficult to scope with the range of possibilities thrown up by real systems. Perhaps this particular cross-platform technology is coming of age.

JBuilder is make use of the standard Java frameworks and a 100% pure java system. JBuilder, however, is platform independent in the run sense and development sense as well. For instance, a compiled program should work perfectly on any platform as long as a suitable JVM exists. It is more accurate to think of JBuilder as a language environment build with the same philosophy. This sort of technological split is exactly what Microsoft's.NET system is designed to eliminate in its language product but they are only single platform. JBuilder provide most of facilities that user would expect of an easy to use visual programming environment although it is based on different technology.

User can create forms using AWT framework components and swing and a range of additional components created by Borland. The generated Java form is fairly traditional similar to form generated by visual basic. The familiar visual basic user should be able adapted to java form. Once a component is place on a form, user can set properties and enter code to define event handlers. It doesn't have any event code generation facilities.

User is provided with large number of wizards by JBuilder to help along the way. It supports the creation of EJB – Enterprise java Beans – via wizards, which also support JSP. JBuilder consists of additional JMS and EAR wizards. The JMR wizard allows users to consumers using publish and subscribe or point to point models and construct Java Messaging Server product. On the other hand, the EAR wizard helps in creating an J2EE application much easier by allowing user build Enterprise Archive files and makes the final step of deploying.

Furthermore, JBuilder supports a split project file structure. Project files are stored as a private part, which stores transient details such as breakpoints and a public part, which stores build information. Version controlling and tracking has been extended, with support for CVS (concurrent versions system) visualsourcesafe and rational clearcase. CVC is installed automatically but there is an exception for Linux. If there is no alternative version control system installed, the user just only install it.

Moreover, JBuilder consist of a new file compare option. This enables user to view files differences side-by-side. Synchronous scrolling is also available in the 'history' windows. Jbuilder introduce some new ideas and all the usual Java web support – applets, servlets.

Advantage of JBuilder

The following are the advantage of JBuilder

i. It's very easy to use and jump right into it, thereby it's perfect for existing staff up to speed in developing or bringing new java applications.

ii. It enables user to edit certain region of code.

iii. It is java-based, thereby platform independent. It perform well in Linux, Windows 2000 and Windows XP.

iv. Open tools architecture is provided and result in making it for a very extensible IDE.

Disadvantage of JBuilder

However, some disadvantage exists in JBuilder. The following are the disadvantages:

i. After using it several hours, JBuilder consumes large amounts of memory and become unstable.

ii. JBuilder is lack of build in version control system. Since IDEs such as IBM's visual age for java come packaged with a very nice VCS, this make JBuilder less competitive.

iii. There are no other nice features that are becoming popular these days or automatic update.

2.4.2 Forte

Sun attempt to produce a solid java IDE, thereby Forte is produced. Recently, much emphasis has been placed on IDEs. Many developers have come to appreciate for its supporting tools and a language not for its syntax and overall design. The most obvious sample is PowerBuilder and visual basic. There are two of the most popular language solutions for the IDE and simplicity.

To avoid become outdated, sun attempting to take part of the development tools and make java a more viable alternative to languages such as PowerBuilder, visual basic, Delphi and others.

Last time, Forte was known as NetBeans, back then, the IDE was multi platform and could be used for free. Sun had purchased NetBeans and renamed it as Forte. Sun enhance the Forte's strength and conserved the good thing of it. It's become a very well rounded and comprehensive IDE.

Forte able used multiple floating windows for each 'palette' in the IDE, which is this ability is relies on personal preference.

Auto update feature is another impressive feature of Forte. The user will be asked whether interest in looking for any update or patches. This is the advantage for Forte. Even though Forte doesn't include a version control system, it does make adding support a snap. Forte is bundling of all necessary file together that are different with JBuilder's approach. For JBuilder's user, they have to separately install the documents.

Unfortunately, there are some pretty big problems with Forte. It use of ridiculous read-only code regions, which are generated by Forte. User can't exchange them. This makes it less user friendly because they fail to do some tweaking especially user is used to generate functionality and inprise's code parsing. On the other hand, JBuilder handles odd coding techniques very gracefully and doesn't stop from making any changes at all to code.

Serious hardware is required in order to run well. Of course both Forte and JBuilder are very demanding applications. However, JBuilder is more realistic that Forte in running on a 64M machine, 128M or more memory is needed to enable Forte fairly stable.

One of the other big issues with Forte is its complete lack of data - aware components. The entry – level version of Forte and JBuilder are lacking in the database programming arena, but JBuilder has been tailored more to business development than Forte.

When the user complete, find errors, correct them and then recompile the editor leaves a red highlight on the line of last error. In addition, not being able to add a class and right-click on a palette page is a little frustrating as well.

Advantages of Forte

The following reveal some advantages of Forte:

i. It seems to be fairly consistent its performance

ii. A single vendor solutions is possible seems it's provided by Sun.

iii. It has a very nice auto-update feature.

iv. The help facilities are very efficient and are probably some of the best in a java-based application.

Disadvantages of Forte

However, some disadvantages must take into account to make a prudential choice of suitable IDE. The following are disadvantages of Forte:

i. There are read-only code blocks! This is hardly a fault that's unique to Forte, but it's nonetheless difficult to swallow after working with JBuilder's hands-off approach.

ii. The overall feel of Forte and coding paradigm isn't as high-level as popular development tools like PowerBuilder, Delphi and visual basic. This makes more cost incur.

iii. It has generic appeal and lacking in some areas such as data-aware control and JDBC tools. It didn't adapt my particular type of programming.

iv. The GUI Builder lack of WYSIWYG approach. When use rare editing a form, for example, adding a pane and choosing a border layout won't display the actual dimensions in the designer.

2.4.3 Comparison Strengthen between IDE

Table 2.1 comparison table between IDE

JBuilder strength	Forte strength
It's better suite for database programming or business environment.	With its generic approach, it might be better suited for educational purposes.
It's much more intuitive, especially for those who are familiar with PowerBuilder, Visual Basic and Delphi.	The help system is superior and it's packaged a little better.
The interface is simpler and cleaner. It provides keyboard shortcuts and it's not cluttered with many different windows.	It seems to run over longer periods of time smoothly.
Inprise is a well-established IDE company and has prove itself time, JBuilder is following Delphi's proven IDE structure.	It might be better suited to company that are more control over coding standards and looking for less flexibilities.
It's better suited for those with non-CVS version control system (like PVCS) or small-to-medium development company.	It's better suited for company that are looking for an all-in-one IDE (it includes pre-configured support for CVS)

Overall, it's difficult to decide which IDE is better, they both have weaknesses and strength. Which is better choice depends on users needs. Although Forte provides a better version control readiness, an excellent configuration panel and auto update. JBuilder is a nicer IDE to use overall and provides more comprehensives programming support. Forte lacks many of the tools and wizards that are typical in JBuilder and too generic. JBuilder,

on the other hand, seems to always fit just right, whether writing server-side application, or client-side application or database application. JBuilder allows user to change whatever source codes and so call less intrusive. As a result, JBuilder is chosen as a development tool in developing the system.

2.5 Existing System Reviews

2.5.1 Lesson Plan Handheld Application (http://www.tapperware.com)

Lesson Plan Handheld Application developed by Thomas Ward is consists of four major modules which are school days, periods, classes and schedule. Four of them are interrelated with each other. Lesson Plan Handheld Application runs in Palm OS 3.0 or higher and it fits in most of the Palm Devices available today.

2.5.1.1 Features

Figure 2.1 School Days Screen

This screen allow user to select the days of the week during which classes are held at school.

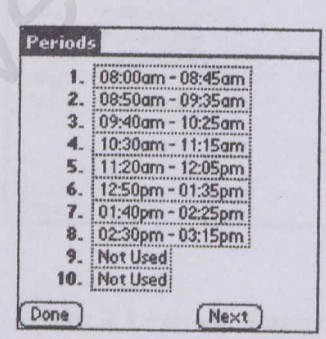


Figure 2.2 Periods Screen

The screen allow user to specify start and end time for each period at school. It can up to 20 periods.

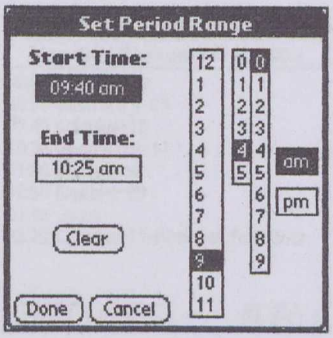


Figure 2.3 Periods Screen

This screen allows user to specify the start and end time for a class period.

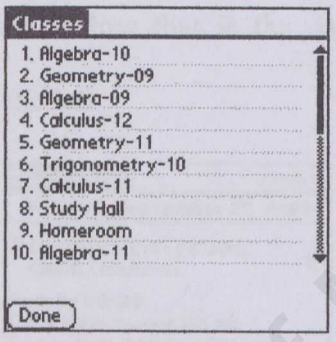


Figure 2.4 Periods Screen

This screen allows user to enter the classes that user attend.

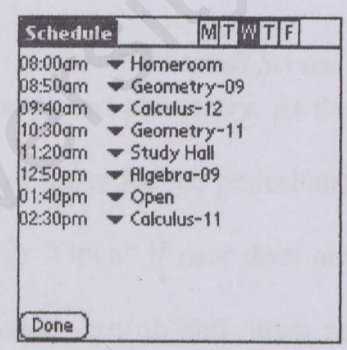


Figure 2.5 Periods Screen

This screen allows user to set their schedule for each school day that is checked on the school days screen, and each period user set on the periods screen.

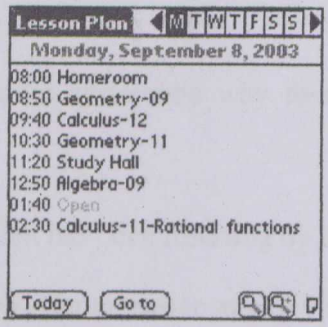


Figure 2.6 Periods Screen

This screen displays a day's lesson plan entries. In the top right corner is the day of week indicator and the weekly arrows. Below that is the date. Each period's start time or number is listed in a column on the left.

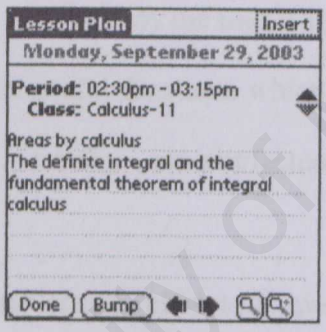


Figure 2.7 Periods Screen

This screen displays a particular lesson plan entry. At the top of the screen is the current date. Below that are the range of times for the period and the name of the class to which this lesson plan entry applies, or "Open" if user does not have a class scheduled on this day and period. At the right edges are up and down scrolls, which will switch to the previous and next period's lesson plan entry.

2.5.1.2 Advantages

- The system provides a more systematic way to manage student class schedule
- The schedule and classes that has been inserting by the student will be display out in an alphabetical order which offer an easier way to view the information.
- There is an additional day note function which allows the user to insert any important note for a particular day to remind the user about the important event.

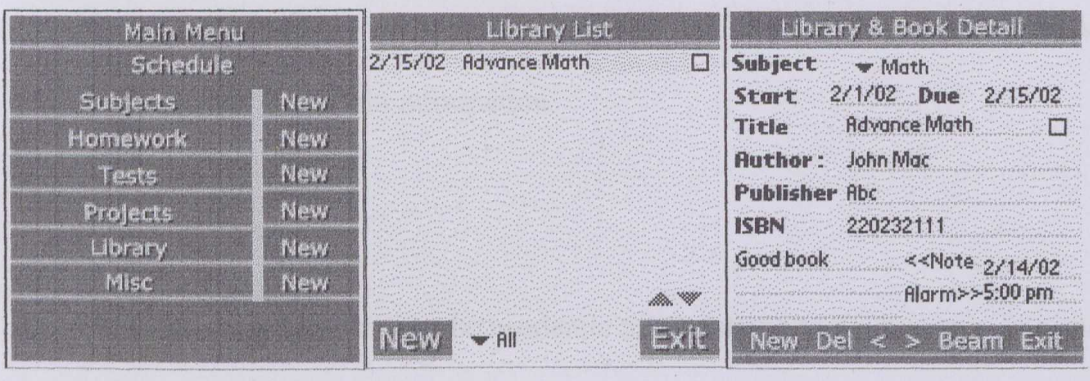
2.5.1.3 Disadvantage

- The number of period that can insert by the user is limit to 20 periods.
- This system lack of several useful functions which will be needed by the student. There are academic result, student/lecturer/teacher information and project/assignment.
- Each lesson plan entry user create refers to a specific period. Therefore, if user insert or delete a period, lesson plan entries user has already made will refer to the wrong period.

2.5.2 Student Assistant 2020

(http://www.handango.com)

Student Assistant 2020 is developed by Calyn. Student Assistant 2020 is a colorful student planner program. It helps you manage and organize everything including schedule, subjects, homework, tests, projects, library books and MISC (like holiday, special meeting).



2.5.2.1 Features

There are six major functions in the Student Assistant 2020. There are:

Subject – Enable the users to insert the information about the subject that they have such as subject code, subject name, subject description and etc.

Homework – Enable users to keep the record of homework more efficiently such as assign date and due date.

Test – Enable users to keep a record of all tests that will attend by the users and the date of the test.

Project – Enable users to keep record of the project and the due date.

Library – Enable users to keep information of the book such as ISBN, publisher, author and etc.

Misc – Enable users to keep other special events like meeting.

2.5.2.1 Advantage

- The system provides plenty of function which is useful to the student such as homework, project, test and others.

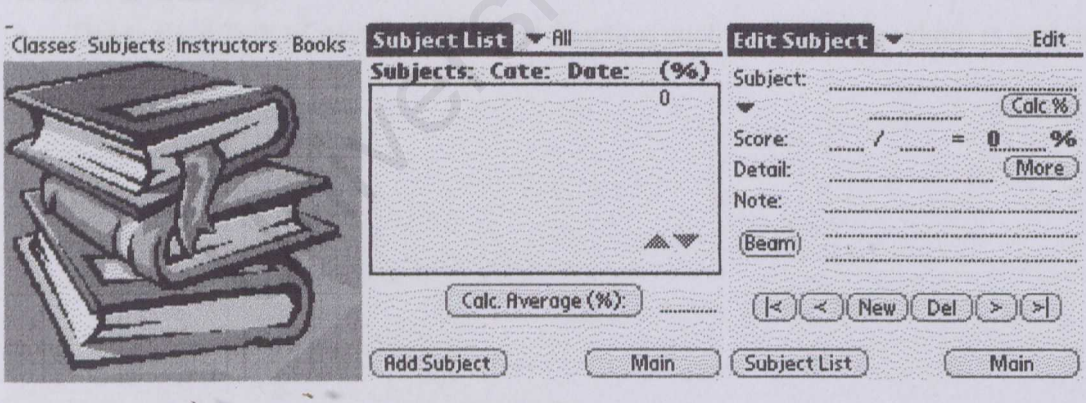
- All the information in the system is sorted by the date which provides a more easy way to search for certain information.

2.5.2.2 Disadvantage

- The system doesn't provide the academic result function which is very important to the student.
- All the function is almost the same as every of it consists only storing the information but did not provide any other additional function such as calculating the result or generate any timetable.

2.5.3 Student Organizer

The Student Organize is designed for students who want to keep track on their class information such as instructors' info, subject names, textbooks, scores and percents in each category or user can see how they are doing in average.



2.5.3.1 Features

There are four major functions in the student organizer. There are:

Classes – Enable users to enter class information into record such as class name, department, instructor and etc.

Subject – Enable users to enter subject information into record such as note for that subject and calculate the score for that subject.

Instructor – Enable users to enter instructor information into record such as instructor name, telephone number and etc.

Books – Enable users to enter book information into record such as title, author, publisher and etc.

2.5.3.2 Advantage

- Provide the user to calculate the score for certain subject
- Provide a more attractive interface for user

2.5.3.3 Disadvantage

- The system lack of certain important function such as timetable which is very useful to the student.

2.5.4 Comparison between existing system and proposed system

Below is a comparison table between the existing system and PalmForce system.

Table 2.2 comparison table between the existing system and PalmForce system

	1	2	3	4
Schedule			√	√
Homework		√	√	√
Project/Assignment		√		√
Test		√		√
Book	√	√		√
Teacher/lecturer	√			√
Subject	√	√	√	√
Classes	√			√

1 – Student Organizer

2 – Student Assistant 2020

3 - Lesson Plan Handheld Application

4 – PalmForce (Educational Organizer)

3.1 Methodology

To produce a correct software system, the way the software development process is handled is an essential ingredient. The ultimate goal is of providing users with products that meet their needs and expectations.

The recognition of the software crisis led to the birth of software engineering which, in turn, led to structured models for describing the software life cycle in order to make the process predictable and controllable – resulting in the production of a correct software system.

Software development process needs three transformations

i. From the needs in the real world, to the problem statements
ii. From the problem statement to a detailed implementation statements
iii. From the implementation statement to an operational system

There are various methodologies available for software development. A methodology is composed of a *Software Development Model* used in conjunction with one or more *Software Development Techniques*. The correct choice of methodology plays a crucial role for the delivery of reliable and correct software products. The chosen methodology must match the characteristics of the problem domain.

Three models widely used today are:

i. Waterfall Method first proposed by W.W Royce

ii. Spiral Model first proposed by Barry Boehm

iii. Evolutionary Model first proposed by T. Gilb

And three techniques widely used are:

i. Prototyping

ii. Cleanroom

iii. Object-Oriented Technologies & Software Reuse

Other important methods and tools that help in developing software, which is correct, are

i. CASE tools

ii. Formal Methods

This chapter explains the best methods chosen and decided upon for use in undertaking the project. The methodology selected is based on the result of the literature review as discussed in Chapter 2 to explain in a comprehensive manner the methodology, mechanism and approach to be adopted.

Chapter 3
Software Development Methodology

3.1 Project Prototyping

The software prototyping methodology is used due to the fact that is allows the entire systems to be constructed quickly and easily. This assists in the understanding and clarifying requirements and objectives and reduces the risk of failure in the development of the PalmForce Organizer System.

Prototyping is a technique for building a quick and rough version of a desired system or part of that system. The prototype shows the system to users and designers what if would or could possibly look like and function. It allows the identification of flaws and creates avenues to improve the system. It allows the system designer to collaborate with users to review the designed system.

Listed below are the advantages of using the prototyping model

i. Prototyping encourages and requires active end-user participation. This increases because the system appears real to the end-users.

ii. Iteration and change are a natural consequence of systems development because end-users tend to change their minds. Prototyping better fits this natural situation because it assumes that a prototype evolves.

iii. The assumption that end-users are not able to specifically identify all their requirements until they see the system, allows prototyping to be a flexible method.

iv. An approved prototype is a working equivalent to a paper design specification and allows flaws or errors to be detected much earlier.

v. Prototyping allows quicker user feedback.

Even with all these advantages, prototyping has its own disadvantages. These disadvantages are listed below.

i. Prototyping does not eliminate the need for the system analysis phases.
ii. Substitution of a paper specification and design cannot be fully done with prototyping
iii. Prototyping often leads to premature commitment to a design
iv. Complexity and scope of a system can expand beyond original plans
v. Prototyping can reduce creativity in designs, meaning certain solutions are overlooked during implementation.

As will all over software development, prototyping begins with requirement gathering. After the identification of requirements, a design is formulated. It focuses on the top level architecture and the data description issues. This in turn creates the prototype. The prototype is tested and evaluated to refine the requirements and fix whatever flaws that maybe encountered. The prototyping model consists of 6 steps and is shown in figure 3.1

3.1.1 Requirement analysis

Prototyping begins with requirement gathering and analysis. In this step, the developer and user meet and define the overall objectives for the software and identify requirements that are needed and outline areas where further definition is mandatory. End user interviews and questionnaires are given out during this step. Feedback from the

questionnaire pinpoint that PalmForce Organizer report management and creation is the most important factor in the system.

3.1.2 Quick design

After the requirement analysis phase is done, a quick design takes place. The quick design focuses on a representation of the aspects of the software that is visible to the user. This phase is one of the most important steps in the creation of a prototype.

3.1.3 Prototype Constitution

The prototype is created and consists of programs to move data back and forth between screen, the database report and the input and output used in the interface. These prototypes do basic processing and test data is used from a preset database.

3.1.4 Prototype Evaluation

The user or owner evaluates the tested design prototype. They are allowed to test, report flaws and suggest improvement. Users are allowed to have a hands-on trial of the prototype and evaluate the prototype.

3.1.5 Requirement Refinement

The prototype evaluation step is used to redefine the requirements for the system that is to be developed. A process of re-iteration happens as the prototype is improved to satisfy the needs of the users. New requirements can be added as seen fit.

3.1.6 Product Creation

This is when all the requirements are met and the engineering of the actual product can be put together.

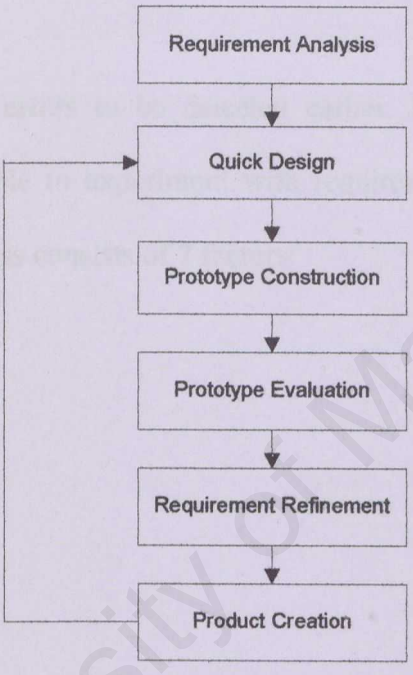


Figure 3.1 Prototyping Model

3.2 Reason for choosing prototype model

1. Prototypes are inexpensive to build

The cost of building a prototype for PalmForce is relatively less than building a fully working application and this enable the project to be developed easily without much problem.

2. Fewer Errors

Prototype model can allow errors to be detected earlier. Requirements validation is performed since users are able to experiment with requirements and the system. The requirements validation process consists of 7 factors:

- correctness
- consistency
- completeness
- realistic
- needed
- verifiable
- traceable

3. More opportunity for changes

Some of the requirements proposed in this project earlier were change from time to time according the needs of each module and also because of the specific time frame given for it to be completed.

4. Unfamiliar with Palm programs' interface

Since Palm programs are quite new for me and I only have little knowledge and experience using it, then prototype is the best method to be used because it can help to reduce errors in the end of the product.

5. Designing a system for users' needs and expectations

Using prototype in development better fits with users' needs and expectations. A Palm Organizer mainly concentrates on the needs of the users especially those who want an application to help them to organize their daily schedule. Furthermore, being a user-friendly application, this project has graphical user interface that is attractive, direct and easy to understand.

3.3 Information Gathering Techniques

Information gathering serves as a method to outline and help identify requirements needed for the development of the proposed PalmForce Organizer System. The information gathering techniques that have been utilized in the development of the system is listed below:

i. Documentation and related system review

ii. Internet

iii. Interview and Questionnaire

3.3.1 Documentation and Related System Review

Many information systems developed are based, partially or fully, on existing systems. Therefore the review of existing systems and their documentation is where the first facts are found. The researcher is able to identify good characteristic of other systems and adapt it to the proposed system.

3.3.2 Internet

Traversing the Internet for related and up-to-date technologies proves to be very worthwhile. The Internet offers a wide range of information pertaining to available technology and their latest improvements. Through the internet, previous review or documentation can be retrieved and this method works well with the technique of documentation and related system review.

3.3.3 Interview and Questionnaire

Interview are carried out with end-user who are directly involved with PalmForce Organizer System in FCSIT. Interviewing is used to further identify system requirements and pin-point areas of development that used to be stressed. A questionnaire is also created to be distributed to end-user who is unavailable for interview to gain their suggestions and requirements for the system.

3.4 Chapter Summary

In order to develop a system that is really fulfilled the users needs, a proper development process model should be followed. The model should be chosen carefully, according to the needs of the development process and the unique features in the system.

This chapter reveals the methodology that had been chosen to develop the system. The model chosen is the prototype model which in short means developing the system by referring to the user feedback on the prototype. With this model, user will have more chances to view their opinion to the developers, thus allow the developers to change the system according to the user's needs. In addition, this model would be less cost expensive compared to other models. Errors can be detected in a much earlier stage during the development process so that it can be solve before it is too late.

Prototyping consist of several main steps, and they are identifying known knowledge, develop working model, use prototype, review prototype and repeat prototyping as needed. These steps are discussed in this chapter as well. With this discussion, we'll be able to have a clearer picture on how to develop this system by following the correct path.

With the help of the prototyping model, it is hoped that the project will go on smoothly. The strong point of the prototyping model can help a lot to bring this project to success.

Chapter 4
System Analysis

4.1 System Analysis

This chapter provides details of the activities undertaken for system analysis purposes.

System analysis activities make up the selection of the prototyping model as described in chapter 3, determination of user requirements, and analysis of system needs.

Fundamental of any system analysis activities are the focus and adherence to the Triple P Principle. They are people, procedures and policies. People are critical aspect to be determined as they are the eventual users of the system and the interface is important to them, as it is the only means through which interactions with the system are accommodated. Procedures define the steps in a method by which organizations get things accomplished. All entities come with their own set of procedures and this must be honored in the new system. Policies on the other hand are the rules by which users must abide to and they are the determinant to procedures in the first place. As such, they should be approached and examined cautiously during analysis as well.

The purposes of this analysis phase are:

i. To acquire knowledge on how does an online room reservation and patient information system work.
ii. To survey how available system of this type had been developed and how does it work.
iii. Research on how this system can be developed using current or maybe latest new emerging technologies.
iv. To gain an overall understanding of system data flow and system process.
v. To identify the major components that will to be included in the system.

vi. To analyze and plan control features to develop a robust and reliable system.

4.2 User Analysis

4.2.1 Questionnaire

One of the main methods used to obtain information requirements and perceptions from users is by issuing questionnaire. A questionnaire is a document containing a set of standard questions that can be sent to many individuals for the purpose of collecting information about the system.

The advantages of using the questionnaire are:

i. This is the best technique to collect data from a large group of people.

ii. The responses form different individuals can be tabulated and analyzed quickly.

iii. The identity of the respondents will not be known; this will encourage the respondents to provide real facts.

The motives behind the use of questionnaire are:

i. The potential users (students) would come from different background and therefore widely dispersed. So questionnaire is deemed the best method to reach out to them.

ii. Used to gauge overall opinion before the project is given any specific direction.

iii. To clarify the weaknesses of the current system by further validating them through the opinions of prospective users.

iv. To determine user's expectancy of behavioral and non-behavioral requirements.

For the questionnaire performed for the development of education organizer, a combination of closed and open-ended question was used. Open-ended questions are utilized to obtain opinions from all kinds of user on the problem faced by the current system used by the palm user and certain other topics. Closed questions are represented by multiple-choice questions with some exclusive options for each question.

4.2.2 The respondents

This survey is conducted to know the students response of educational organizer. The respondents were school students (secondary, pre-university, college and university) and also higher education students. The questionnaire was distributed to the students of 80. This is to make sure that I include enough respondents to allow for a reasonable sample in the event that some questionnaires are not returned or some response sheets are incorrectly completed and thus must be discarded.

4.2.3 Survey Response

The questionnaires were collected back to do analysis for the user requirements. As we know, the number of the questionnaire which was collected cannot be analyzed if it is not completed well or not returned at all. The same situation happened in this survey, in which the responses from the secondary students were not that remarkable.

4.2.4 Result

Data which were collected has to be analyzed before the synthesis can be conducted. I analyzed the questionnaire which I received back with answer on it. The analysis result is shown below.

Table 4.1 Existing system usage by student for personal information system

	Existing System	Total	Percentage (%)
1.	Special Book	16	20
2.	PDA Organizer	18	22.5
3.	Computer	46	57.5

From the survey, it's clear that more than half of the total of student which is 57.5% uses the computer to keep their personal information. The second method is to use PDA organizer in which 22.5% students involved. The special book is popular among the students for keeping information purpose.

2) Evaluating of Existing System

The existing system for personal information and time management function for the students have to be evaluated. Table 4.2 shows the evaluation of the existing system by the students in the perspective of difficultness

Table 4.2 Evaluation of Existing System in the term of difficultness

Difficultness	Total	Percentage (%)
Yes	51	63.8
No	29	36.2

The students were asked to evaluate about their existing system for organizing information and scheduling purpose. From the statistic, it shows that most of the students which are 63.8% find difficultness in managing information and daily tasks. Besides that, only 36.2% of students don't find any problem with their existing system. However this doesn't mean that they need not to have a system which is compact with all the functions.

This is because they were asked about the features of their existing system. Those who find no difficultness with their existing system chose that their system couldn't keep track of their past record and also it doesn't incorporate both functions in one system.

3) Computer Literacy of the Students

The purpose of this question is to know the percentage of students who have computer knowledge. Table 4.3 shows the students computer literacy.

Table 4.3 Statistical Result on the Students Computer Literacy

Difficultness	Total	Percentage (%)
Yes	71	88.8
No	9	11.2

The statistic reveals that most of the students have computer knowledge. This is because most of the studies are related to computer work. So, it is possible for the students to have their own information and management manager in their PDA. This is because in order to use PDA, there is a need to have knowledge on computer since both computer and PDA is interrelated.

4) User requirements in Educational Organizer

The student view on the requirements that should be incorporated in Educational Organizer are showed in table 4.4

Table 4.4 student view on the requirements that should be incorporated in Educational Organizer

Category	Personal Information	Time Management	Personal Information & Time Management
Total	27	13	40
Percentage (%)	33.7	16.3	50

Two main features are presented in the questionnaire which enables the student to choose the features that they want to be incorporated in the Educational Organizer. The personal information feature gains the higher percentage which is 33.7% compared to time management features. The time management only being chooses by 16.3% of students. However, the highest percentage goes to both functions which are 50%. One of the reasons why both functions are highly preferred is because the students need a proper and better method for keeping information as well as organizing and managing forthcoming events.

5) Personal information and Time Management

Personal Information and Time Management function were both chosen by majority of students. So, the personal information function ought to have certain features which suits the students needs. They are student/lecturer/teacher information, academic result, text/reference book information and student notes. Thus the management function will have class timetable, meeting and project/assignment. Table 4.5 and Figure 3.1 show the number of students who prefers any of these features. They can choose as many features as they want to be underneath both main functions.

Table 4.5 Features of Educational Organizer being chosen by students

	Total	Percentage (%)
A. Personal Information		
1. student/lecturer/teacher information	36	45
2. academic result	58	72.5
	14	17.5

3. text/reference book information 4. student notes	26	32.5
B. Time Management 1. class timetable 2. meeting 3. project/assignment	 69 18 49	 86.2 22.5 61.2

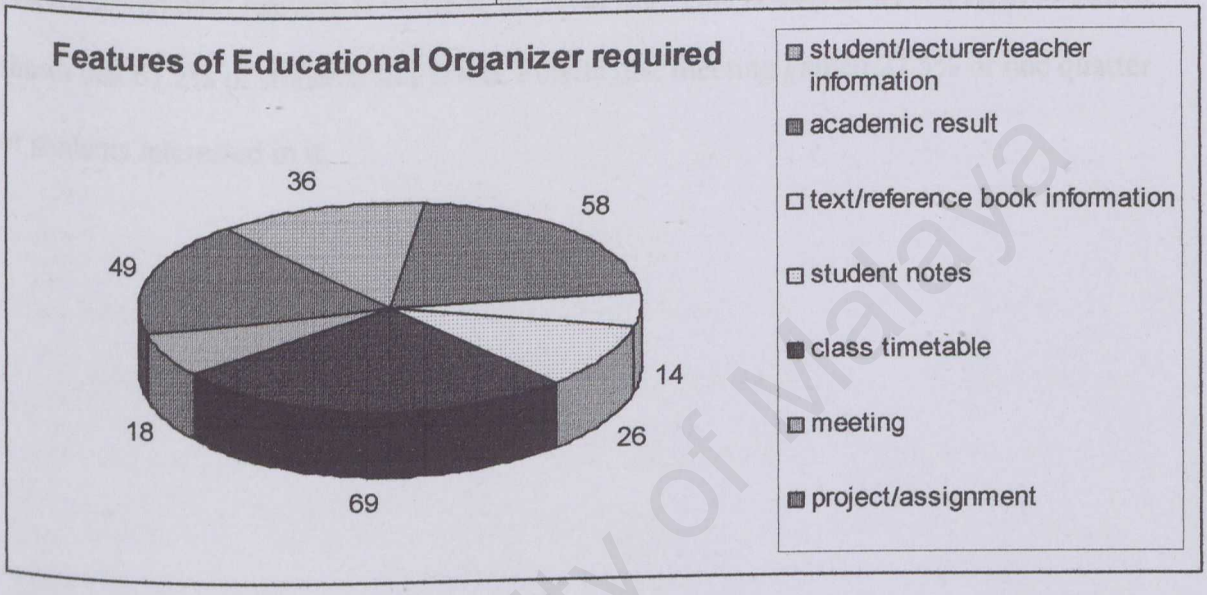


Figure 4.1 Chart shows the features of Educational Organizer Required

Statistic has shown that the Educational Organizer will provide a lot of features that are suitable for students. Every students need to keep information and the most important one is the class timetable.

This is proven by the analysis which shows that 72.5% of students prefer to have academic result feature in that system. Besides that, 45% of students would also like to keep their own/lecturer/teacher information. Student notes is very important as well, in which 32.5% students prefer this feature. Finally, students have to be systematic in the

matter of text/reference book information too, 17.5% wants to have this feature in Educational Organizer.

While for the time management, class timetable is the most important feature among all the other features as it gains 86.2% of students wants it to be included in the system. As business people are busy, students also quite busy in this modern age, so the project/assignment features is suitable for them too. This is proved by the statistic which shows that 61.2% of students like it too. Finally, the meeting gained 22.5% or one quarter of students interested in it.

4.3 Requirements Analysis

The initial task of the requirements analysis phase is to identify requirements. Actually, the objectives of the information system serve as a basis to outline the functional and nonfunctional requirements that are needed to develop the PalmForce Organizer System.

The requirements for any system are divided into two parts, the functional requirements and the nonfunctional requirements.

A functional requirement is a description of activities and services the system must provide. Functional requirements are frequently identified in terms of inputs, outputs, processes and stored data that are needed to satisfy the system objectives.

A nonfunctional requirement is a description of other features, characteristics and constraints that sums up to a satisfactory system. Nonfunctional requirements would cover requirements such as performance, ease of use, user-friendliness, security, quality management and others.

4.3.1 Functional requirements

The functional requirements cover the operation ability of all the modules. As stated in the project overview, the two modules to be covered are University/College Module and the School Module.

4.3.2 University/College Module Functional Requirements

The University/College module can be divided into four separate sub modules which are personal information module, class/reference module, exam/assignment, schedule

module. Each of these modules has their own functionality and can be better shown graphically in figure 4.1. Some of the functionality from each module may overlap one another.

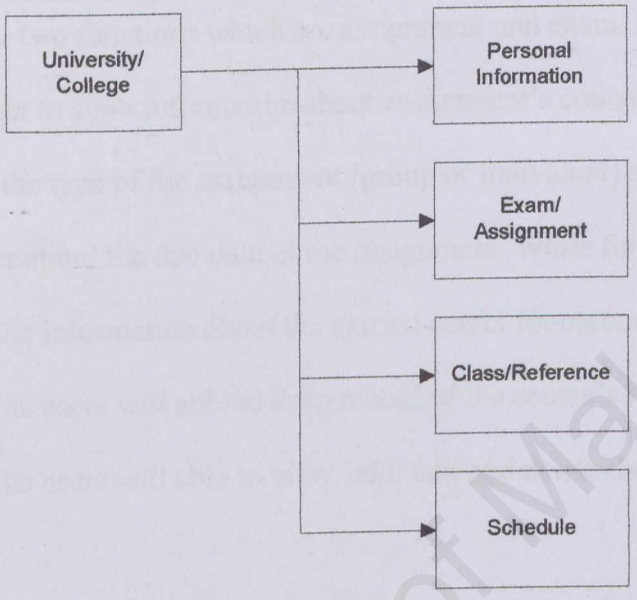


Figure 4.2 University/College Modules

4.3.2.1 Personal Information

This module is mainly use to stored the information about the course that university/college student have been taken. For example, the information like the code for that course, the course's name, the lecturer that will going teach for that course, the credit hour for that course and some other detail that can entered by the user which user think that is needed. Besides that, this module also contain another function which allow the user to store the information about the lecturer like lecturer's name, the lecturer's consultation time, the lecturer's office, the lecturer's phone number, email and fax

number. The users will able to view, add, edit and delete the course's and lecturer's information.

4.3.2.2 Exam/Assignment

This module contains two functions which are assignment and exam. For assignment function, it enable user to store information about assignment's course, assignment's assign and due date, the type of the assignment (group or individual) and the reminder to keep reminds the user about the due date of the assignment. While for the exam function, it enable user insert the information about the carried marks for certain course in certain semester and year. The users will able to keep record of the course's mark for certain semester and year. The users will able to view, add, edit and delete the assignment's information.

4.3.2.3 Class/Reference

This module contains two functions which are library book and class. For library book, it enable user to store information about the book that the user have been borrowed from the library like the book's title, the book's borrow date and return date, the related course for the that book, the book's publisher, the book's author, the book's ISBN and extra that users wish to keep for record. While for the class functions, it enable user to keep the record for the course that the class belongs to, the class start time and end time and the day that for the class. The users will able to view, add, edit and delete the library's and class's information.

4.3.2.4 Schedule

This module contains two functions which are timetable and graph. For timetable, it enable the user to view for the class in a timetable so that it will give a more clear picture for the user which day that the user should attend for certain class. While for the graph, the user can view for the graph for CGP for all the semester for certain years, CGP for all the years and the complete list for every semester and year.

4.3.3 School Module Functional Requirements

The School module can be divided into five separate sub modules which are teacher module, subject module, class module, homework module and test module. Each of these modules has their own functionality and can be better shown graphically in figure 4.2. Some of the functionality from each module may overlap one another.

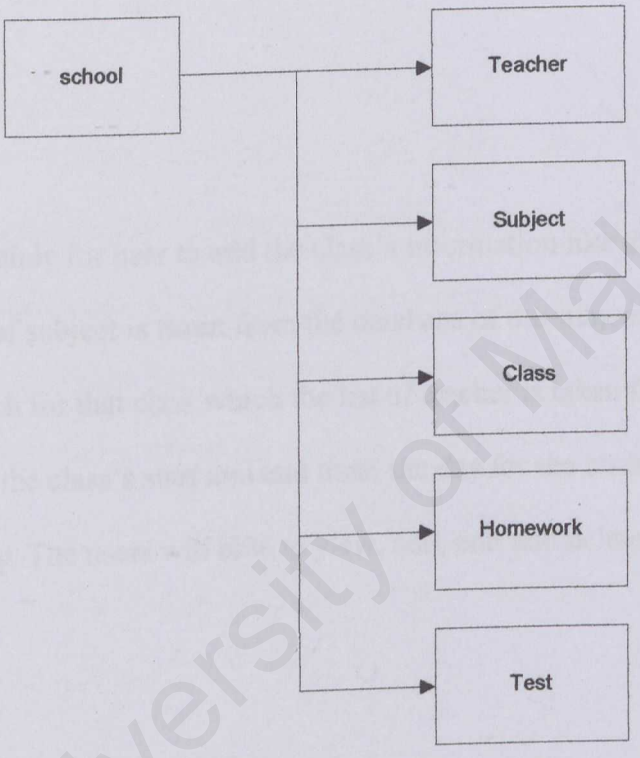


Figure 4.3 School Modules

4.3.3.1 Teacher

This module is mainly for user to keep record of their teacher's information. For example, user can insert teacher's name, the subject that have been taught by the teacher, the teacher's office, teacher's phone number, email or fax number. The user can view all

these information through the teacher sub module. The users will able to view, add, edit and delete the teacher's information.

4.3.3.2 Subject

These modules enable the user to enter the subject's name, the subject's abbreviation and detail of the subject. The users will able to view, add, edit and delete the subject's information.

4.3.3.3 Class

These modules is mainly for user to add the class's information like the subject of the class which the list of subject is taken from the database of the subject module, the teacher that will teach for that class which the list of teacher is taken from the database of the teacher module, the class's start and end time, the day for the class and extra note that the user wish to keep. The users will able to view, add, edit and delete the class's information.

4.3.3.4 Homework

These modules is mainly for user to add the homework's information like the subject of the homework which the list of subject is taken from the database of the subject module, the assign and due date for the homework, the title of the homework, the reminder and the detail of the homework. The users will able to view, add, edit and delete the homework's information.

4.3.3.5 Test

These modules are mainly for user to calculate the total mark for certain subject. There are a few input fields for user to insert data in order to calculate for the marks. First, the user will have to choose for the subject. And then, the user needs to insert the mark that user get, full mark of the test and the percentage of the total marks for that test. Then, it automatically calculates the real mark for the test and the total mark for that subject.

4.3.4 Nonfunctional requirements

Non-functional requirements are the other factors that must be taken into consideration in the systems development cycle. These requirements are very subjective but they play important roles to ensures the system robustness and successful. The non-functional requirements define the system properties and constraints. Examples of system properties are usability and user friendliness of the system, modularity and maintainability of the system, robustness, consistency, reliability and dependability of the system and legislation. Examples of the system constraints are system cost and implementation.

4.3.4.1 Reliability

A system is said to have reliability if it does not produce dangerous or costly failures when it is used in a reasonable manner, that is, in a manner that instructed by the system. PalmForce system is reliable and dependable software because it does not cause physical or economical damage in the event of system failure as the program was designed into three independent modules. Appropriate messages and prompts were designed to enable user follow step by step easily in using the system. Assumption was encountered by the

system design in order to prevent user acts in a unusual pattern. The system should be reliable in performing required functions and operation under stated conditions for stated period of time. It should not cause unnecessary and unplanned down time of the overall environment.

4.3.4.2 Usability and user friendliness

PalmForce system utilizes the GUI. The GUI provides better visual meaning to the user. The usage of suitable and meaningful icons helps to ensure that users will use the system with more confidence and avoid mistakes made by user unintentionally. The icons conveyed information's concise, easy to understand and meaningful. Appropriate prompts and instruction will be shown to guide the user along the operation of the system or throughout the entire installation of the system. The screen should show only that which is necessary for the particular action being undertaken. Screen should be designed to make it easy to move from one screen to another. By using color or shaded boxes and creating three-dimensional boxes and arrows, form can be made user-friendly and fun to use.

4.3.4.3 Modularity and maintainability

The system coding and design is implemented by using the modular approach so that it can be easily enhanced in the future. The procedure, subroutine and methods in the program are written in the modular. With this, it makes the program easier to understand in the later time. Its reusability of some common procedures or functions will save a lot

of development time and prevent the code redundancy. Later maintenance to the system can save a lot of efforts.

4.3.4.4 Consistency

Screen can be kept consistent by locating information in the same area each time a new screen is accessed. Information that logically belongs together should be consistently grouped together. It can also enhance the simplicity of the system.

4.3.4.5 Robustness

The system consists of two modules which will be completely tested to ensure each module achieve it expectation. The modules are integrated into system and system testing is started after process integration. Any errors that were discovered during system testing are solved immediately. This is to make sure the system is as robust as what had been expected before.

4.3.4.6 Response time

The response time for retrieving the information should be short. The input validation should be performed to minimize the time wasted for passing the input data.

4.4 Technology and Tools Selection

4.4.1 Programming Language Selection

Java is chosen as the programming language to be used. Upon analyzing and comparison with other language review such Visual Basic and C++, java proves to be the better choice. This being java is an open sourced language and is easily understandable. Java is also one of the most current and new technology available on the Internet.

4.4.2 Authoring Tool Selection

A few authoring are used in the development of the system. Listed below are tools that are used.

4.4.2.1 JBuilder

JBuilder is chosen as the authoring tool for the development of the system. Upon analyzing and comparison with other tools like Forte, JBuilder proves to be the better choice. This being JBuilder is nicer IDE to use overall and provides more comprehensives programming support compare to other IDE like Forte.

4.4.2.2 Photoshop 7.0

Photoshop is chosen as the graphic design tool for the development of the system. Photoshop 7.0 is one of the most popular graphic design tool that are available in the market and it proves to be the most effective tool for designing the user interface for website or system. Photoshop 7.0 appears to be an effective tools to edit some of the icon

and picture that will going to use in the system due to the limitation size of the screen for the PDAs.

4.5 Hardware and Software Requirements

Tables below the minimum hardware and software requirements needed to operate the PalmForce Organizer System.

Table 4.6 Minimum user's hardware requirements

Computer Processor Unit	Processor not less than 500MHz
Build-in Memory	Not less than 64Mb
Screen	Color

Table 4.7 Minimum developer's hardware requirements

Computer Processor Unit	*Processor not less than 1.0GHz*
Hard Disk Space	*10.0GB*
Random Access Memory	*128MB RAM*
Additional devices	*Printer, USB port, Serial port*

Table 4.8 Minimum software requirements

Palm Operating System	Support Palm OS 4.0 and later version
Operating System	Microsoft Windows XP Professional
Authoring software	Borland JBuilder 9.0
Designing Software	Photoshop 7.0

4.6 Chapter Summary

In the development of the PalmForce Organizer System, the system encompasses these functional requirements.

i. Ability for user to create and view reports and statistic related to Educational Organizer courses.

ii. Allow user to store their lecturer's information to the organizer with brief description.

iii. The system allow the generation of reports, lesson plan and thinking points.

iv. A template for course evaluation and test is available for the student to calculate their carried marks.

v. Students are able to work with their assignment and homework so that it will keep reminds the student about the due date of the assignment or homework.

vi. Students are available to view their mark from the test and the CGP and CGPA for their semester result.

Non-functional requirement for the system:

i. Reliability

ii. Usability and user friendliness

iii. Modularity and maintainability

iv. Consistency

v. Robustness

vi. Response time

Software requirement for the system:

i. Palm OS 4.0 and later version

ii. Microsoft Windows XP Professional

iii. Borland JBuilder 9.0

iv. Photoshop 7.0

Chapter 5
System Design

5.1 System Design

System design is considered as an important part of the system development process. It sits at the technical kernel of the system development process. System design is utilized and applied regardless of what kind of development model or standard being used. In shorts, system design is a process to convert the conceptual ideas from requirement specification in system analysis into more technical specification.

In system design phase, the system requirements gathered during the analysis phase are transmitted into a representation or a "blueprint" for constructing the system. Initially, this representation depicts a holistic view of system. There are series of activities involved in system design process, namely, analyzing, coding, and testing the system or prototyping to ensure that it conform to the software specifications and requirements, which have been defined in earlier stages.

Under this chapter, the system design will be discuss in the following categories:

- System Architecture
- System Functionality Design
- Database Design
- Interface Design

5.2 System Architecture

In architecture design, large systems are decomposed into sub-systems that provide some related set of services. This is the initial design process of identifying sub-systems and establishing a framework for sub-system control and communication. Besides, the sub-systems that make up the whole system and their relationship are identified and documented.

The system is structured into a number of principal sub-systems are where a sub-system is an independent software unit. Communications between sub-systems are identified. Decomposing a system into a set of interacting sub-systems is an important phase.

This project design is based on data flow oriented design. It is also called structured design. This type of design stresses on modularity, top-down design and structured programming.

5.2.1 System Structure Chart

Structure chart is used to depict high level of abstraction of a specific system. The use of structure chart is to describe the interaction between independent modules. Major functions form the initial component part of the structure chart, which can be broken into detailed sub-component. Educational organizer system is divided into two major components which are University/College and School. Each of these two components is further divided into many sub-modules as shown in figure 5.2 and 5.3 below shows the structure chart of Educational organizer system.

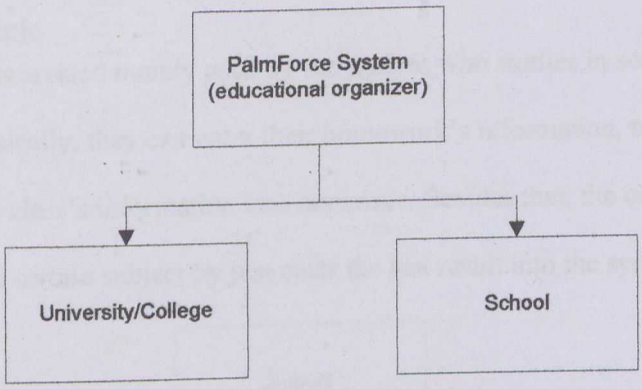


Figure 5.1 the structure chart of educational organizer

5.2.1.1 University/College Module

This module is created mainly used by the student who studies in university or college to manage their daily work and update their data. Besides, users also can calculate their result of exam according to the course that they have been taken. For example, the users are able to calculate the CGPA and CGP for their course. Thus, the users can view through an automatically generated graph to show the CGP for every semester and year.

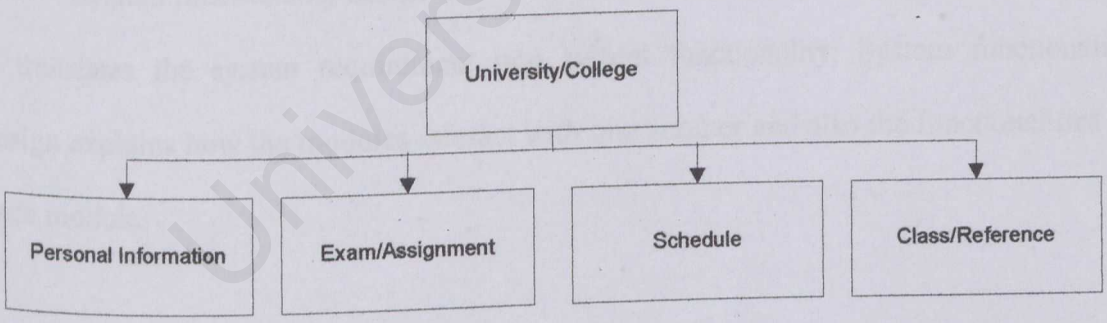


Figure 5.2 the structure chart of university/college

5.2.1.2 School Module

This module is created mainly used by the student who studies in school to organize their homework or test. Basically, they can enter their homework's information, teacher's information, subject's information, class's information into organizer. Besides that, the organizer will able to calculate the result for certain subject by just enter the test result into the system.

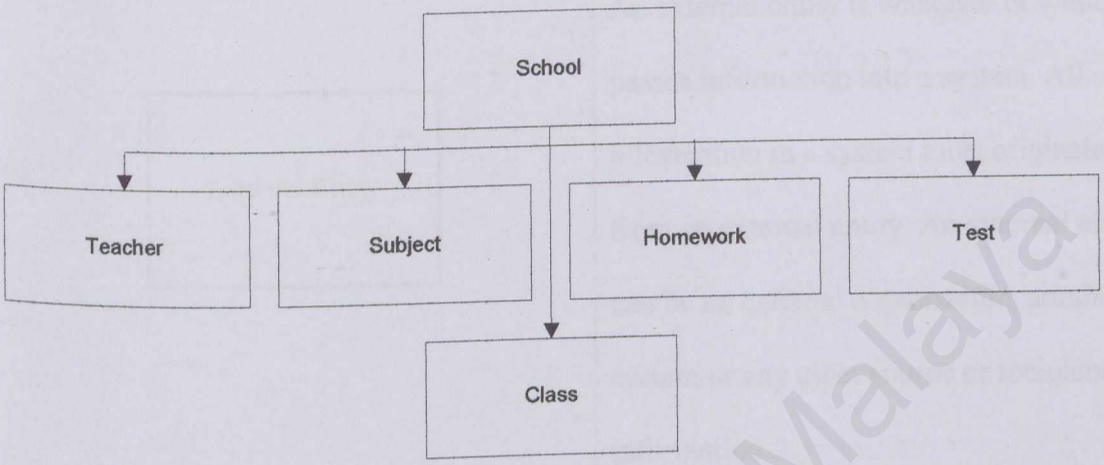


Figure 5.3 the structure chart of school

5.3 System Functionality Design

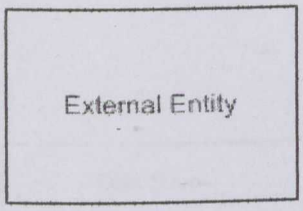
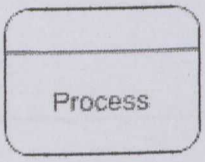
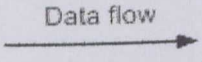
System functionality design based on the system requirements stated in Chapter 4. It translates the system requirement into system functionality. System functionality design explains how the modules interact with one another and also the functionalities in each module.

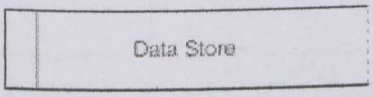
5.3.1 Data Flow Diagram

A data flow diagram (DFD) shows how data moves through an information system but does not show program logic or processing steps (shelly et al, 2001). DFDs represent a logical model that shows what the system does, not how it does it. It is used to

show how data enters and leaves the system, what processes change the data, where data is stored within the system, together with external entities that make up the system.

Table 5.1 Components of Data Flow Diagram Using Gane & Sarson Approach

Component	Description
	An external entity is whatever or whoever passes information into a system. All information in a system must originate from an external entity. An external entity can be an external organization, another system or any other source or recipient of information.
	A process receive input data and produces output that has a different content, form, or both. A process is represented by a rectangle with rounded corners. The name of the process appears inside the rectangle. The process name identifies a specific function and consists of a verb followed by a singular form.
	A data flow is a path for data to move from one part of the system to another. A data flow in a DFD represents one or more data items. A data flow is

	represented on the diagram by a line with an arrow head showing the direction of the flow of the information. It is labeled with a description of the information being passed.
	A data store, or a data repository, is used in a DFD to represent a situation in which the system must retain data because one or more processes need to use the stored data at a later time. The symbol for a data store is flat rectangle that is open on the right side and closed on the left side. The name of the data store appears between the lines.

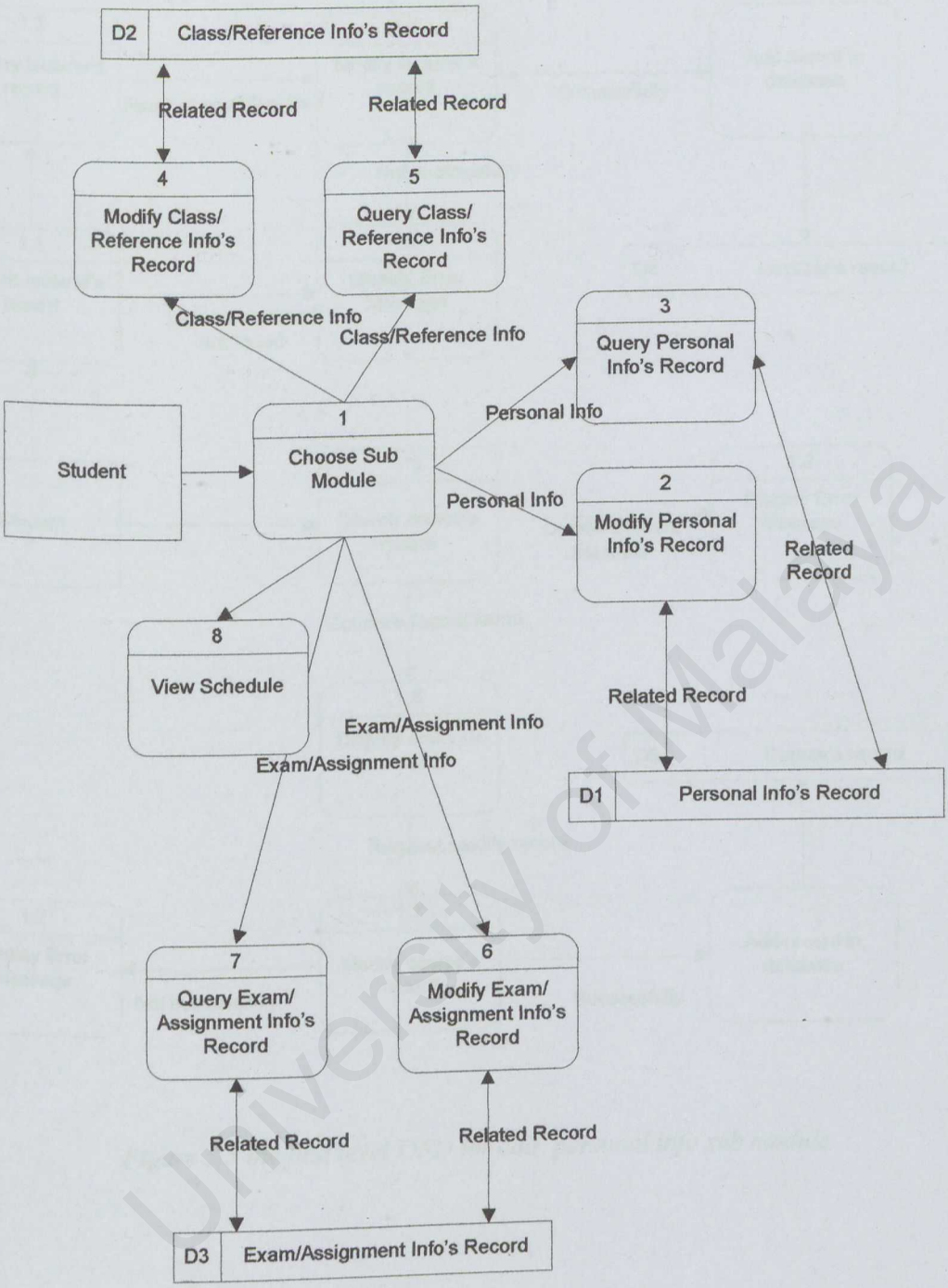


Figure 5.4 the zero level DFD for university/college module

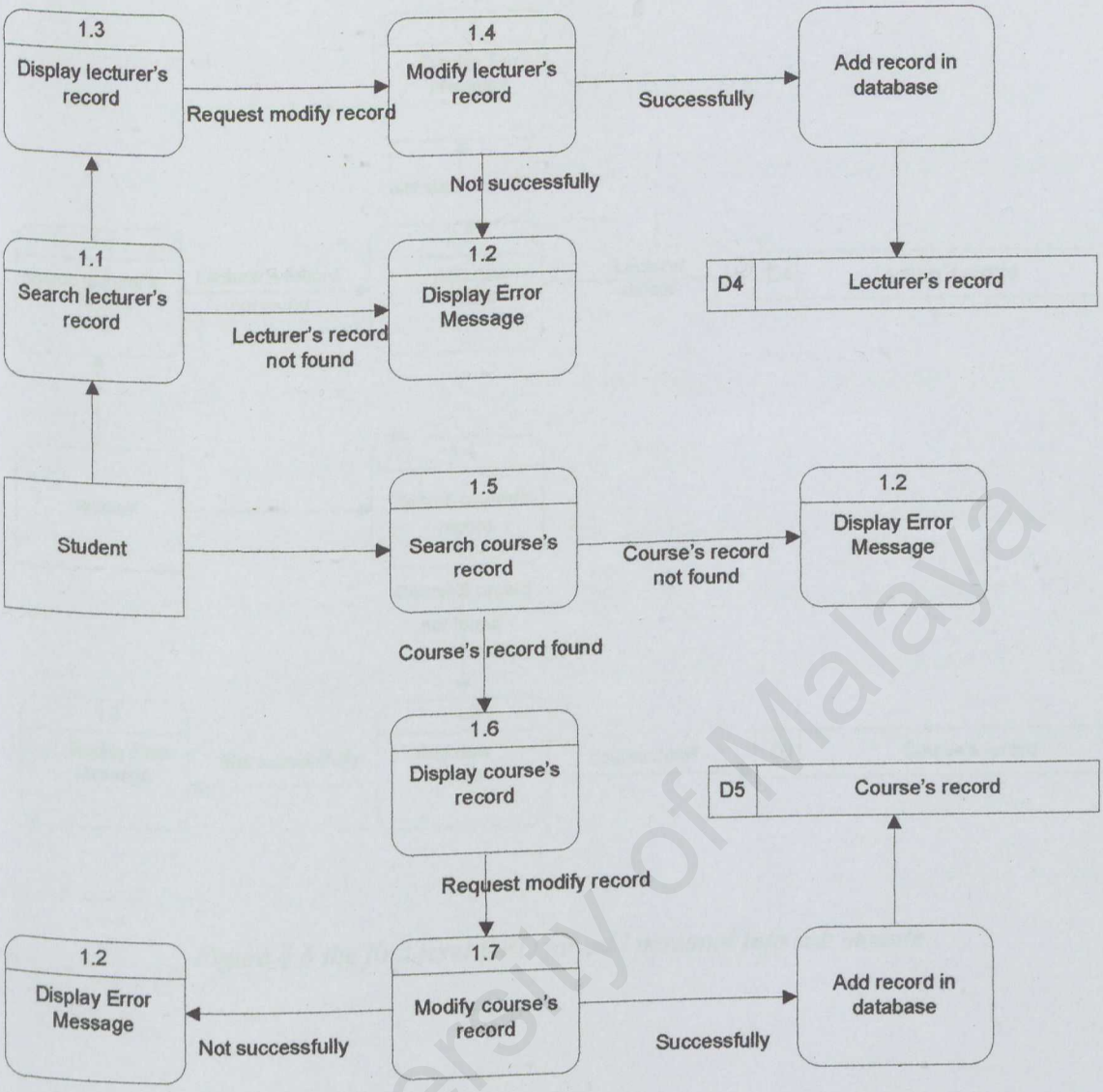


Figure 5.5 the first level DFD for edit personal info sub module

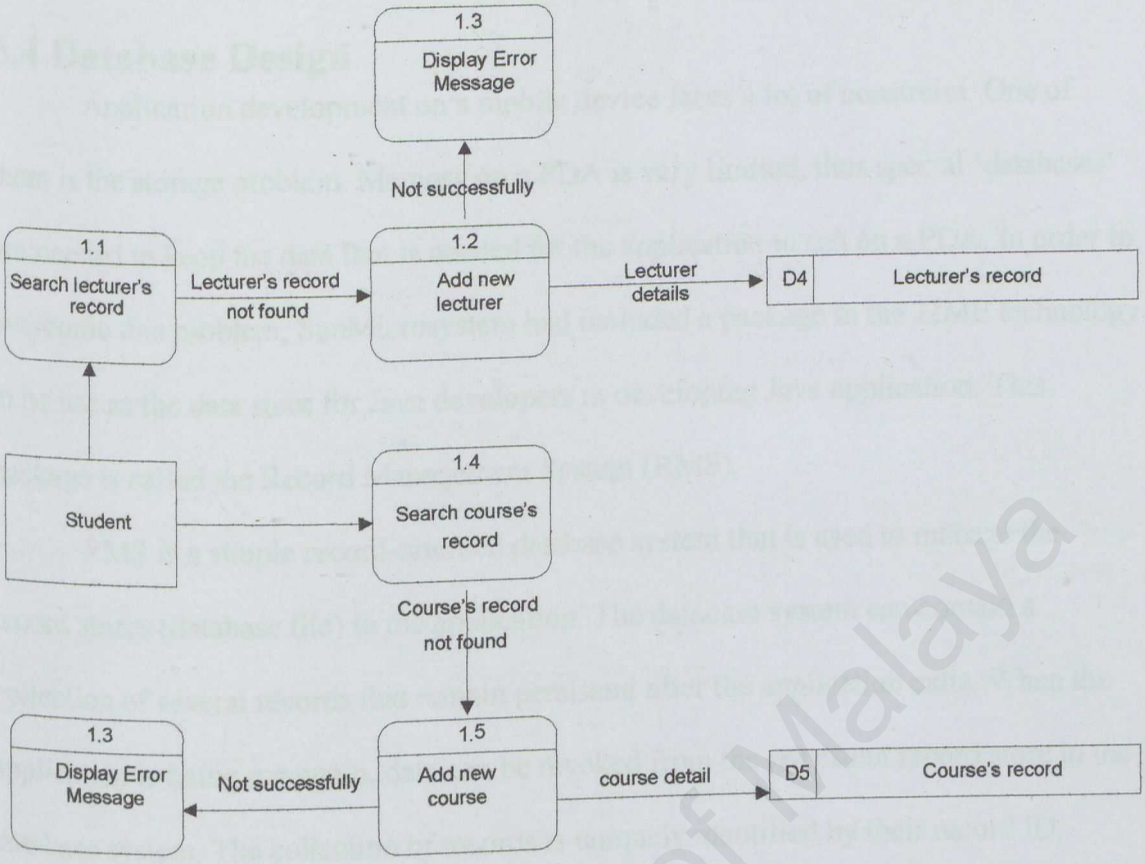


Figure 5.6 the first level DFD for add personal info sub module

5.4 Database Design

Application development on a mobile device faces a lot of constraint. One of them is the storage problem. Memory on a PDA is very limited, thus special 'databases' are needed to keep the data that is needed for the application to run on a PDA. In order to overcome this problem, SunMicrosystem had included a package in the J2ME technology to be use as the data store for Java developers in developing Java application. This package is called the Record Management System (RMS).

RMS is a simple record-oriented database system that is used to manage the record stores (database file) in the application. The database system can contain a collection of several records that remain persistent after the application exits. When the application is being run again, data can be revoked from the persistent record store in the database system. The collection of records is uniquely identified by their record ID, which is an integer value. The data for PalmForce is store in several record stores. Below is the basic design for Educational Organizer in PalmForce.

1) Reminder

This record store is being used to keep the reminder information that PalmForce receive from the user. The data kept in here are the reminder status ,the event that needs to be reminded, the event's time and the date.

Data field	Data type	Description
Status	Boolean	Set to true if the reminder is active, otherwise false
Event	Varchar	The location of the event in the record store
Date	Date	The date of the event
Time	Time	The time of the event

2) Subject

This record store stores the information about the subject that is being studied by the user. The data stored in here include the name of the subject, the class day and the period of time for the class,

Data field	Data type	Description
Name	String	The name of the subject
Code	Varchar	The code of the subject
Instructor	String	The instructor of the subject
Day	Day	The day where the subject has class
StartTime	Time	The start time for the class
EndTime	Time	The end time for the class

3) Study notes

This record store is used to keep the notes made by the user for studies purposes. These short notes then can be viewed by the user later. The data stored here include the notes written and the date of saving,

Data field	Data type	Description
Notes	String	The notes
Date	Date	The date

4) Classes

This record store contains the class information of the user. All the details about the user are being kept here. The data field kept here includes the class name, Department, Instructor, Classroom, Class time, Webpage,

Data field	Data type	Description
Class name	String	The name of the class
Department	String	Department that class

		belongs to
Instructor	String	The instructor of the class
Classroom	Varchar	The classroom of the class
Class time	Time	The start and end time for the class
Webpage	Varchar	The webpage for that class

5) Test

This record store contains the test information of the user. All the details about the user are being kept here. The data field kept here includes subject, date, time, title, reminder, detail,

Data field	Data type	Description
Subject	String	The name of the subject
Date	Date	Date for the test
Time	Time	Time for the test
Title	String	Title for the test
Reminder	Time and date	The reminding date and time for the test
Detail	String	The detail for the test

6) Homework

This record store contains the homework information of the user. All the details about the user are being kept here. The data field kept here includes subject name, assign date, due date, title, detail, reminder, detail,

Data field	Data type	Description
Name	String	The name of the subject
Date	Date	Assign date
Time	Time	Assign time
Title	String	Title for the homework
Reminder	Time and date	The reminding date and time for the homework
Detail	String	The detail for the homework

7) Instructor

This record store contains the instructor information of the user. All the details about the user are being kept here. The data field kept here includes name, office, office hours, phone, email,

Data field	Data type	Description
Name	String	The name of the instructor
Office	String	The location of the office
Office Hour	Time	The office time
Phone	Number	Instructor phone number
Email	Varchar	The email of the instructor

8) Book

This record store contains the book information of the user. All the details about the user are being kept here. The data field kept here includes class, title, author, publisher, ISBN, purchase price, purchase date, borrow date, due date, details

Data field	Data type	Description
Class	String	The class that use this book
Title	String	The title of the book
Author	String	The author of the book
Publisher	String	The publisher of the book
ISBN	Number	The ISBN number of the book
Purchase price	Float	The purchase price of the book
Purchase date	Date	The purchase date of the book
Borrow date	Date	The starting borrow date
Due date	Date	The due date of the library book
Details	String	The details of the book

9) Schedule

This record store contains the schedule information of the user. All the details about the user are being kept here. The data field kept here includes school days, period, classes, detail,

Data field	Data type	Description
School days	String	The day which need to go to school
Period	Date and time	The date and time of the class during school days
Classes	String	The name of the classes
Details	String	The detail of the classes

10) Educational settings

This record store holds the important information that will be needed in some of the function of the educational modules. The data stored here includes the calculation formula for the CGPA, and the formula to calculate the result,

Data field	Data type	Description
CGPAformula	String	The formula to calculate CGPA
Resultformula	String	The formula to calculate the result

11) Project/Assignment

This record store contains the test information of the user. All the details about the user are being kept here. The data field kept here includes subject, date; time, title, reminder, detail,

Data field	Data type	Description
Subject	String	The subject for the project
Date	Date	Date for the project
Title	String	Title for the project
Reminder	Time and date	The reminding date and time for the project
Detail	String	The detail for the project

5.4 User Interface Design

The Human Computer Interface (HCI), commonly known as user interface is doorway into an interactive software application. The user interface design describes how software communicates within itself, to system that interoperates with it, and also with human being who use it. An interface is a set of commands through which a user communicates with the library automation system. The user interface is one of the most important parts of any program because it determines how easily user can makes the system do what he or she want.

Nowadays, there are two types of user interface: a command-driven interface (text based) and a menu-driven interface (graphical user). A command-driven interface involves user entering commands while a menu-driven interface is one in which user selects command choices from various menus displayed on screen. Below are several principles that need to be highlighted during the system interface design.

- Consistency
- Recoverability
- Confirmation and verification message
- Responsiveness
- Reverse action

5.4.1 Graphical User Interface

A Graphical User Interface (GUI) is a graphical (rather than purely textual) user interface to the library automation system that intended to provide direct correlation between the visual stimulus on the computer screen and the desired response from the library system. A good GUI should be intuitive, minimum the need for user to memorize things and must be interesting to look at.

The advantages of Graphical User Interface:

- Certainty, that the interface will look the same on any operating system with all mainstream browsers
- Enables frequent users to use shortcuts
- Attractive
- Offer informative feedback
- User friendly
- Easy to use
- Able to communicate the information to the user easily

5.5 Chapter Summary

Chapter Five present the system architecture, system functionality design, database design and interface design. The structured design system architecture was chosen for this system. System functionality design explains the process in PalmForce where data flow diagram was used to graphically characterize data process and flows in the system. For database design, there are represent by the table for each table in the database. There are about 11 tables in the data dictionary that act as the description of the database structure and contents. Some proposed interface designs were included for the user interface design.

Chapter 6
System Implementation

6.1 System Implementation

System Implementation involves the translation of the software representation produced during the design phase into a computer readable form. This is the phase that involves coding and writing of the program using several development tools.

6.2 Development Environment

There are a few strategies can be applied in this proposed system such as top down design and modular development. Development strategies are very important because it determines how the coding process begins, debugs, testing and maintains. Thus, determines the right and suitable strategies from the beginning are vital. Any development strategies changes in the middle of system development will increase the cost and development time of the entire system.

6.2.1 Hardware Configuration

In order to implement the system, the following minimum requirements must be met:

i. Standard input/output peripherals

ii. Pentium or AMD with 1GHz processor or more

iii. 10GB of hard disk space

iv. 256 RAM or more

6.2.2 Tool used for System Development

The right kind of system tool is vital in the development of the system. Table 5.1 below list the software used for the development of the PalmForce Organizer System:

6.3 Implementation of PalmForce Organizer System (Educational Organizer)

6.3.1 Function Implementation

6.3.1.1 Add Function

Implemented in the lecturer unit as add lecturer's information, course unit as add course's information, library unit as add library book's information, class unit as add class's information, assignment unit as add assignment's information and exam unit as add exam's information, teacher unit as add teacher's information, subject unit as add subject's information, homework unit as add homework's information.

Begin with inserting values into the field that have been given to the user and then add those data.

Records are added to the database. The field will reset to default values once the records have been added into the database indicating that the records already been successfully add into the database.

6.3.1.2 Browse/Edit/Update/Delete Function

Implemented in the lecturer unit as browse lecturer's information, course unit as browse course's information, library unit as browse library book's information, class unit as browse class's information, assignment unit as browse assignment's information and exam unit as browse exam's information, teacher unit as browse teacher's information,

subject unit as browse subject's information, homework unit as browse homework's information.

Begin by getting the corresponding record from the database by clicking the next record or previous record button. Or, user can browse record through another way which provides a record list table with eight records in one page. The record list table only provides limited information about the record, so, in order to view detail of the record, user can click on any record in the list table.

User can select which record is preferred to be edited or deleted. Choose 'Edit' or 'Delete' function from the bottom of the page.

Insert the records to be updated in the field and press 'Edit'. The updated information will display on the page when user browse back the same record.

6.3.1.3 Search Function

User can search any record he wants by searching for the next and previous record in the database. If the record exists, the corresponding records will be displayed. Otherwise the system will notify the user that the 'There is no record'.

6.3.2 Module Implementation

Educational Organizer has two main modules:

i. University/College Module

ii. School Module

Each module is implemented using J2ME with the help of JBuilder. The function under each module was implemented by Educational Organizer main two users.

i. University/College Student

ii. School Student

6.4 Platform Development

The platform development will include setting up the development environment, create design with photoshop, create database using RMS method, writing code with JBuilder IDE tools. Operating System installation is the first step to move before we can start off any development work. After that, only we begin the development tools installations. It is essential to know the sequence of products installations to ensure smooth execution without system errors.

6.4.1 Setting Development Environment

i. First, install Microsoft Windows XP Professional

ii. Install JBuilder 9.0

iii. Install Photoshop 7.0

iv. Copy the emulator folder for PDAs.

6.4.2 Create Design with Photoshop 7.0

After installing the photoshop, open the icon or picture that need to be edit. And then, start design the icon or picture by using the embedded tools that photoshop have.

6.5 System Development and Coding

Program development is the process of creating the program needed to satisfy an information system's processing requirements. Developing and coding is the phase which takes the longest time in the development life cycle. Therefore, using the right tool and the right way to develop the system are crucial in determining the success of a project for Educational Organizer, it involves developing using Java programming language. Before starting on the coding process or any other detailed works on the program, a review on the program documentation needs to be done followed by design of the program and finally going into the program coding process.

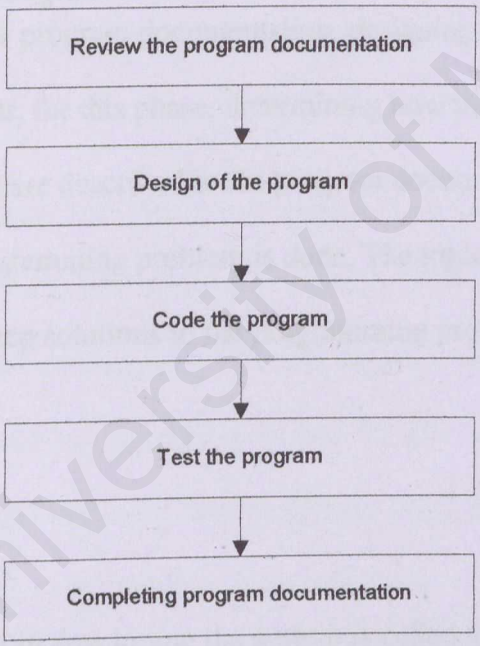


Figure 6.1 System Development Process

6.5.1 System Development Process

6.5.1.1 Review the program documentation

The first and foremost step to be taken in program development phase is to review the program documentation that was prepared during the earlier phase. The program documentation prepared in the system design phase of PalmForce Organizer System (Educational Organizer) consists of architectural view, concept and controls, module flow diagram, data dictionary and also the sample layout of the interface. The documentation provides a guide and an understanding of works that need to be done in the coding phase.

6.5.1.2 Designing of the program

After reviewing the program documentation, designing the program is the next following process after that, for this phase, determining how the program can accomplish features and functions that are described in the program documentation and developing a logical solution to the programming problem is done. The logical solution, or the logic of the program is a step-by-step solutions to the programming problems.

6.5.2 Coding

6.5.2.1 Coding approach

The technique used in developing the system is called the top-down approach, stepwise refinement approach. It is essential for developing a well-structured program. Besides that, java was used as the core programming language in developing the system because we taking into consideration the capabilities and advantages of java. Therefore, for this system, separating between data presentation and implementation is one of the strategies being used while coding.

Top-down Approach involves building the high level software modules that are refined into functions and procedures. That means the higher-level modules to be coded first before the lower level modules. The codes in the lower modules contain only an entry and an exit. A module with such characteristic is called a shell. The higher level modules will reference the lower ones if they are coded and available. Reference to a shell will result in an empty action.

This approach will ensure that the most important modules will be developed and tested first. It also gives a preliminary version of the system sooner.

6.5.2.2 Data Presentation

PalmForce Organizer (Educational Organizer) System is a system aimed at reaching out for its audience through the use of PDAs, coding in J2ME is one of the important processes in developing and coding phase. For this, JBuilder were used. With its support for some simple interface design, coding become easier when any error was detected by color-coding in JBuilder, this made easier to reading through the codes.

6.5.2.3 Example of System Coding

The example of basic coding for PalmForce Organizer (Educational Organizer) System is given below.

i. Coding for database connection

ii. Coding for sending information through form

iii. Data validation

iv. Coding for drawing the user interface

Coding for database connection

```
myRMS subjectRMS = new myRMS("subject", 3);
ChoiceGroup subject;
subjectRMS.openRecord();
for (int i = 1; i <= subjectRMS.numRow(); i++) {
subjectRMS.movePos(i);
subjectRMS.setField(1);
subject.append(subjectRMS.loadData(), null);
}
subjectRMS.closeRecord();
```

The coding above show a database connection which loads some data from the table named subject. The first line shows that we declare an object for the myRMS with table's name subject and 3 fields of data. After that, we will open the record for the subject table. And then, we create a for loop to loop all the data in the table to the choicegroup field. The `subjectRMS.movePos(i);` is use to move the record number i where i is an integer variables in the table. And, `subjectRMS.setField(1);` is use to set the first field from the table since the table has been declare that it has 3 field to store data. After that, we will add the

loaded data into the choicegroup field named subject. Finally, we will close record for the subject table.

Coding for sending information through form

```
if(checkAdd == true){
    PalmForce.ButtonAction(new SemCGP(inputYear));
}
```

Code from SemCGPMenu.java

```
String getYear;
public SemCGP(String inputYear) {
  getYear = inputYear;
  try {
   jbInit();
  }
  catch (Exception e) {
   e.printStackTrace();
  }
}
```

Code from SemCGP.java

For the code from SemCGPMenu.java, if the Boolean variable is true then we will pass the value inputYear to the SemCGP form by calling a build in function for PalmForce – ButtonAction. Then, the constructor in the SemCGP.java will receive the inputYear value and then it will assign another variable string to keep the value in order to use that value for other purpose.

Data validation

```
TextField title;
Alert alert;
else if (title.getString() == "") {
    alert = new Alert("Input Error", "Please enter book's title", null,
                AlertType.WARNING);
    alert.setTimeout(Alert.FOREVER);
    PalmForce.ButtonAction(alert);
    checkAdd = false;
  }
```

Code from Library.java

For the code above, we declare a textfield call title to let user to insert data and a alert object. After that, we will check for the title textfield whether is empty or containing value. If it's empty, then we will prompt out a alert box with title "input error" and message "Please enter book's title" before we can submit those data into the database. So, we will not able to add data if there is empty value in the selected textfield.

Coding for drawing the user interface

```
protected void paint(Graphics g) {
 g.setColor(0, 0, 0);
 g.setFont(Font.getFont(Font.FACE_SYSTEM, Font.STYLE_BOLD, Font.SIZE_LARGE));
 g.drawString("University/College", 30, 20, 0);
}
```

Code from EducationMainMenu.java

For the code above, we are trying draw a string into the form. All the drawing must be done in the class called paint. First, we will use the setColor function to set whatever

color we like. For example, g.setColor(0, 0, 0); will set the color to black. Then, we will set the font properties. There are three properties for the font that we can set the type of font, the size of font and the category of font. After that, we will use the function drawstring to draw the string "university/college" into the form with the coordinate x equals to 30 and coordinate y equals to 20.

6.5.2.4 Coding Style

Coding style is an important attribute of source code. An easy to read source code makes the system easier to maintain and enhance. Elements taken into considerations while coding to maintain and enhance system are internal documentation, standard naming convention and standard graphical user interface.

Internal documentation is achieved by using comments while coding, providing a user guide to programmers for future enhancement. The purpose of statements indicating the modules functions and descriptive comment and was embedded into source code to describe the processing functions.

A standard naming convention and also a standard usage of graphical user interface components is employed in developing the system making standard naming convention provides programmers with easy identification of variables. While a standard in usage of graphical user interface components provides the users an environment that will not generate much surprise to them. Usage of these standards performs as a mean towards coding consistency and standardization.

A good coding practice is needed to avoid confusion and facilitate the detection of errors. Below are good coding practices that have been implemented in the process of developing the system.

i. Import class

Import class was used when certain codes are repeated. It allows procedures to be available to many java files. It also avoids users with the hassle of correcting all java page when a change occur. There are six imported class were used in PalmForce that have identical links to other pages.

```
import palmforce.myDate;
import palmforce.myRMS;
import palmforce.myTable;
import palmforce.firstRMS;
import palmforce.Float;
import palmforce.myFloat;
```

The above class to share by four of us and we all are using the class above to do some functions. For example, the myDate class is used to return a correct date and myRMS class is used to handle the database. While myTable class is used to generate a list of table that we both share to use. But, because of folder structure of my program where I put every file in one folder (palmforce) so I won't have to import those class above in order to use it. It's automatically can be used without import class. For the different folder structure, we will have to import those classes in order to use it.

ii. Comment codes

It is easier for users to understand and troubleshoot the codes if the comments codes are written in coding document. It also helps programmer to recall the coding done previously. Example: "//set the light green color"

```
//set the light green color
g.setColor(241, 88, 34);
//draw header line
g.fillRect(0, 15, 160, 3);
//draw bottom line
g.fillRect(0, 140, 160, 3);
```

iii. Indent codes

It is easier to read and detect error if the codes are indented. Indent codes will be useful in control structures such as loop, if-else, do-while and select cases.

```
for (int i = 1; i <= classesRMS.numRow(); i++) {
    classesRMS.movePos(i);
    //for loop to check for the school days
    for (int j = 1; j <= 5; j++) {
     classesRMS.setField(4);
     String h = classesRMS.loadData();
     String f;
     f = days[j];
     if (classesRMS.loadData().equals(days[j])) {
      //for loop to check for the time
      for (int k = 1; k <= 8; k++) {
       classesRMS.setField(5);
       String p = classesRMS.loadData();
       String q = time[k];
       if (classesRMS.loadData().equals(time[k])) {
        classesRMS.setField(7);
        g.drawString(classesRMS.loadData(), dayPos[j], timePos[k], 0);
```

```
        }
      }
    }
  }
}
```

Code from Timetable.java

6.6 Debugging

Debugging was carried out when the particular functions or codes did not perform what is intended or the worse is that it prompt error when is run or during compilation. Debugging of codes is made easier with the usage of JBuilder when coding in Java. By using the debug project function, developer can run the program line by line to search which line having errors and developer also ca view for the value of the variables that have been set in the program.

After reviewed system development and coding phase which talks about the development environment, program development, coding and debugging, the following chapter will discuss about the system testing from unit testing to acceptance testing and the system implementations.

6.7 Implementation

The implementation is a process of assuring that the information system and network is well operate and then allowing users to take over its operation for use an devaluations for PalmForce Organizer System (Educational Organizer), implementation the information system is the last phase of its system development.

All the users are invited to test the system first. It should be noted that the system work is often cyclical. The discovery of a problem during users testing may force return to the previous phase and modify the work done there.

6.8 Chapter Summary

System implementation is starting of coding and development of system. Some modification of design has been done to make sure the quality of the system performance. Stage involved is setting development environment, system coding and module implementation. The whole chapter describes the approaches used in writing codes, programming language used and algorithms used in implementing the system. It is difficult to write algorithms to make sure the system runs smoothly.

Chapter 7
System Testing

7.1 System Testing

Testing is done throughout the system development and not just at the end. It is a very important step has to be well conducted before the system is delivered to the end user. The main objective of the testing phase is to ensure all the components of the system are executed correctly. All the system's newly written or modified application program as well as procedural manuals, hardware and system interfaces are tested thoroughly. Testing also meant to turn up heretofore-unknown problems. Testing is an essential series of steps that helps assure quality of the system. It is done on many different levels at various intervals as work progresses.

7.2 Objectives of Testing

There are a few reasons why testing must be carried out after the system implementation or coding. The reasons are shown in figure 7.1

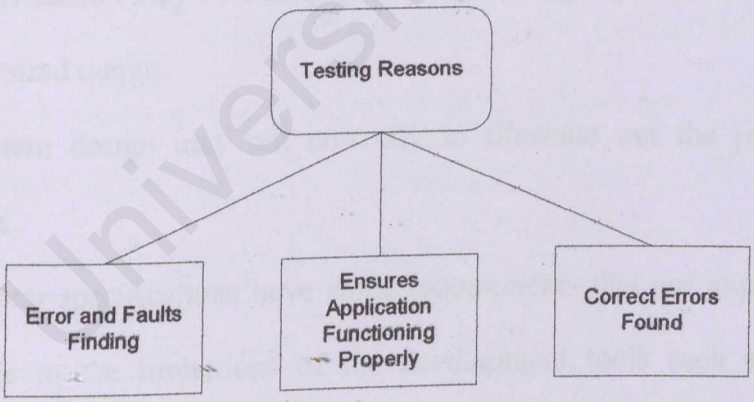


Figure 7.1 shows the reasons of conducting the testing to develop application

7.2.1 Errors and Faults Finding

In an ideal situation, users hopes the programs can work properly and produce the desired outputs once it has been written and run. Unfortunately, this is impossible all the time. Certain errors and faults surely embedded in certain formulas, activities, and algorithms not realized by the programmers.

How this errors and faults are going to detect? This can be done by various kinds of testing such as unit testing, module testing, integration testing and system testing. A set of valid data was used to conduct the different type of testing and examine and output produced. System errors and faults which are undiscovered during the system design and implementation can be identified. But testing is not the first where fault finding occurs, instead the requirement and design reviews also help to uncover faults early in development.

Several reasons that cause the faults and errors in the system had been identified:

i. The specification may be wrong or have a missing requirement and this produce the undesired output.
ii. The system design may not correctly to illustrate out the process and user interface.
iii. The system specifications have some requirements that are impossible to get it done due to the limitations of the development tools such as the usage of multimedia elements in the form and the memory storage in the computer.
iv. The program code may be wrong like missing important functions, variables or formulas.

v. The algorithms of the processing were not reality and logical errors were embedded in the source code.

vi. Faults may found in the program designs and user interface.

7.2.2 Ensure Application Functioning Properly

During system design, system development is usually concentrated on certain situations only. This approach may lighten programmer's efforts to build the system, but at the same time it makes the developer forgot to consider other situations that may produce different result due to the different input required.

In this phase, the tester will apply various sets of valid data according to various types of situations to test the system processing. The application is said to fulfil the requirements and specifications only it executes properly in all situations.

7.2.3 Correct Founded Errors

Once errors or faults are found, appropriate steps and corrections are taken to correct these errors. It may be return to the system design and system implementation to uncover these faults or do the needed modifications to the system requirements and specifications. It refines the system performance.

7.3 Process of Testing

In the testing phase, the system is tested as a single, monolithic unit. PalmForce are built out of modules or sub-systems, which are again, built out of sub-modules which are composed of procedures and functions. The testing process therefore proceed in

stages where testing is carried out incrementally in conjunction with system implementation.

The testing process for PalmForce consists of five stages as shown in figure 7.2 below. In general, the sequence of testing activities not only includes component or unit testing, integration testing and user testing. Due to the fact that defects are discovered at any on stage, they require program modifications to correct them and this required other stages in the testing process to be repeated. Errors in program components come to light at later stages of the testing process. The process is therefore an iterative one with information being fed back from later stages to earlier parts of the process.

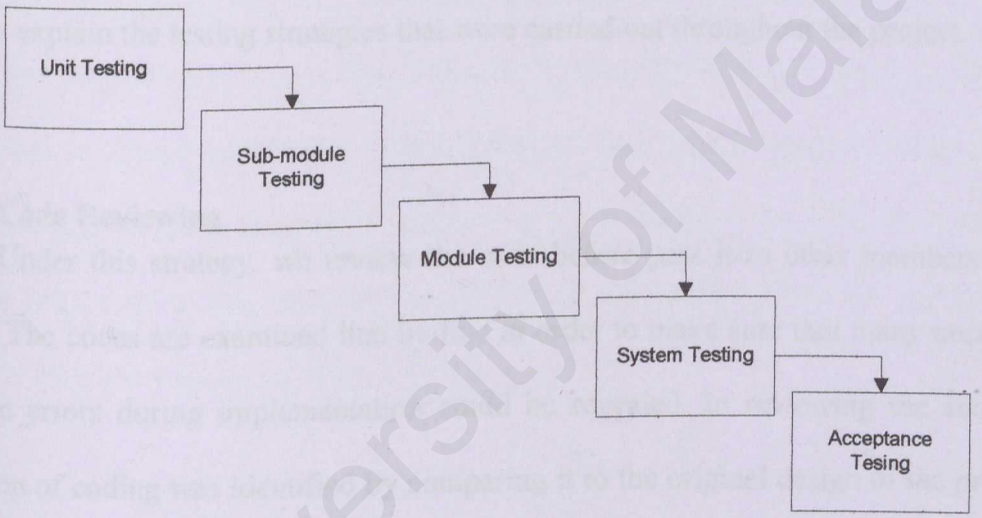


Figure 7.2 shows the testing process

As can seen from the above figure, the arrows from the top of the boxes indicate the normal sequence of testing and the arrows returning to the previous box indicate that previous testing stages is repeated. The stages in the testing process are:

7.3.1 Unit Testing

The unit testing technique was used to ensure that the PalmForce was bug free and without the side effect. Normally after one new module is developed, usually it was tested independently in order to assure their accuracy and to find faults in the modules. There are three kinds of testing strategy carried out for the unit testing. The following sessions explain the testing strategies that were carried out throughout the project.

7.3.1.1 Code Reviewing

Under this strategy, we review the code before pass it to other members in the project. The codes are examined line by line in order to make sure that many uncovered semantic errors during implementation could be revealed. In reviewing the code, the correction of coding was identified by comparing it to the original design of the program flow. When the logic and flow of the program were identified, the code was commented so that is can be traced back in the future. The code was examined and debugged in order to identify any fault coding. It is easier to debug the error using notes formula. We can trace the nodes formula code line by line using the available debugger and it will highlight the error areas. After the testing, the final system is in accordance with the system specifications.

7.3.1.2 Test Cases

Besides reviewing the codes, we use some test cases to test the system. This approach is used as some set of structural input is given and output is observed. This strategy is needed to identify the variance between the prototype and the requirement. In this testing, we input different data to test the program. With this, the reaction of the program to the input data could be tested. Each component is tested independently, without other system components. This could identify the program's faults, which probably happen in normal condition.

7.3.1.3 Testing from Other Users

After the two testing had been used, we launch the beta version of the system to other users for testing purpose. This is to identify the fault that may incur in any other unexpected condition. The testing involved with random data in random situation. From the testing, we get some feedback from the user. This feedback from the users and their different perspectives and ideas provide important information about the usability and reliability and future planning of the system.

7.3.2 Sub-module Testing

A sub-module is a collection of dependent components like collection of procedures and functions. A sub-module encapsulated related components so can be tested without other system sub-modules. For example all the function in the personal information such as view lecturer's information and view course's information are tested once they had been integrated.

7.3.3 Sub-system/ Module Testing

This phase involves testing collections of sub-modules, which have been integrated into module/sub-systems. The most common problem that arises during this stage in the system, as modules are integrated is sub-systems interface mismatched. For example the color of the main function is not match with back end's main page and modification on the module had to be done to improve the system. The module test process therefore concentrate on the detection of interface errors by rigorously exercising these interfaces.

7.3.4 System Testing

The modules are integrated to make up the entire system. The testing process is concerned with finding errors that result from unanticipated interactions between modules and system components. This includes testing the interfaces between modules, the correctness of the output, and the usefulness and understandability of the system documentation and output. It is also concerned with validating that the system meets functional and non-functional requirements.

7.3.5 User Acceptance Testing

This is the final stage in the testing process, before the system is accepted for operational use. The system is tested with data supplied by the end users rather than simulated test data. Acceptance testing reveals errors and omissions in the system requirements definitions because real data exercises the system in different ways from the test data. Acceptance testing also reveals requirements problems where the system's facilities do not really meet the user's needs or the system performance is unacceptable. The testing process continues until the system developer and client agree that the delivered PalmForce is an acceptable implementation of the system requirement.

User acceptance testing is a test on the system to evaluate and demonstrate that the system is ready for operational use. the software customer or the mass public in their environment performs the test. Responses from the system user upon completing the test will be very valuable input to finalize development process. final modification can be done according to the customer comments. it is a normal practice by major software warehouse to distribute beta version of their solutions as a freeware or shareware over the Internet to get feedback from customer of interested public.

the examination for Information technology subject user acceptance test was done a group of students taking information technology subject from the University of Malaya. Eleven students had taken part in the test. It includes survey to get the respondents feedback on the developed software.

the user testing process includes:

1. Mock test
2. Questionnaire

The survey respondents were given the chance to take the mock test. to start the test, the respondents had to installed the palmforce organizer system into their PDAs. If the installation is successful, they would begin to use the organizer system once the installation is completed. if not, they will asked to reinstall the system until the installation is completed. The respondents were given half an hour to complete the test consisting of ten questions. a questionnaire were distributed to the respondents once they

completed the test.

The questionnaire consists of 10 statements as the following:

1. Instruction given to use the organizer system is sufficient
2. Method use to organize and manage the information is appropriate
3. The organizer system is user-friendly.
4. Method use to submit response is practical
5. There are errors on the organizer system
6. The organizer system runtime is fast
7. The organizer system is suitable for the use of managing the daily work of the student from the univesity/college/school
8. The CGP, CGPA and the result of the exam is counted accurately

The respondent must select a value of 1 to 5 to represent their opinion on every statement given on the questionnaire. The scale represents the following value:

1	2	3	4	5
very disagree	disagree	not sure	agree	very agree

7.3.5.1 Data analysis on student responds

The first item in the questionnaire was statement pertaining to sufficiency of the instructions given on the software. A total of 64% of the respondents agreed that the instructions were sufficient while the next 36% selected the very agreed option

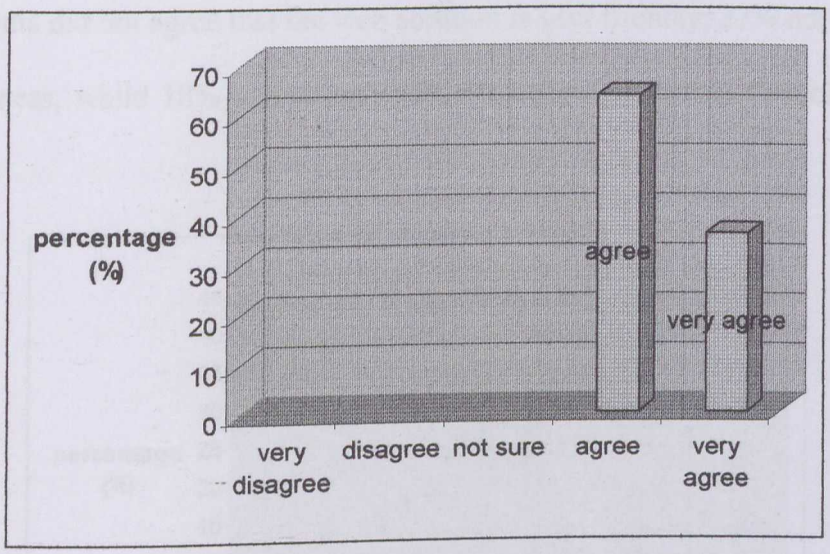


Figure 7.3 instructions given on the organizer system

The second item was method use to organize and manage the information is appropriate. About 9% of the respondents did not agree 18% not sure, another 18% agreed with it while the rest were strongly agree with the method used.

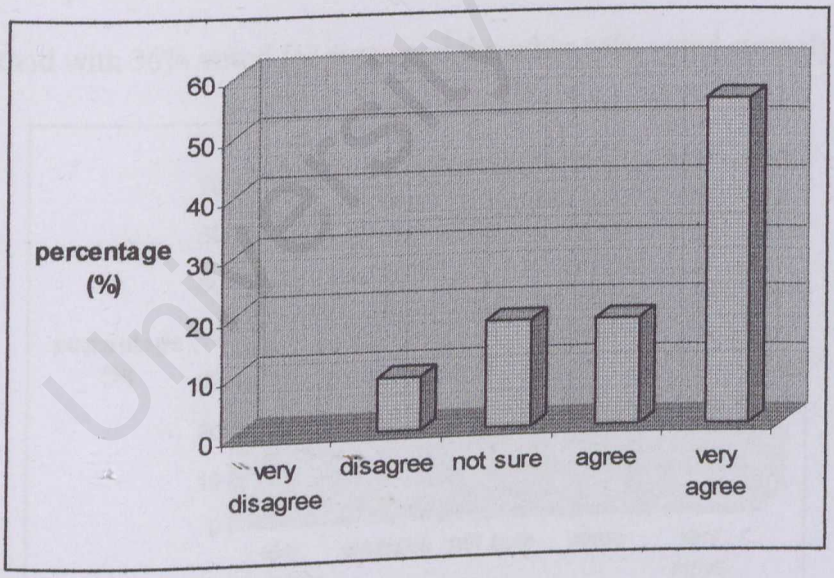


Figure 7.4 method uses to organize and manage the information

The following statement was on user friendliness feature of the organizer system. 9% of

the respondents did not agree that the web solution is user friendly, 27% not sure with the user friendliness, while 18% agreed and 45% strongly agreed that the solution is user friendly.

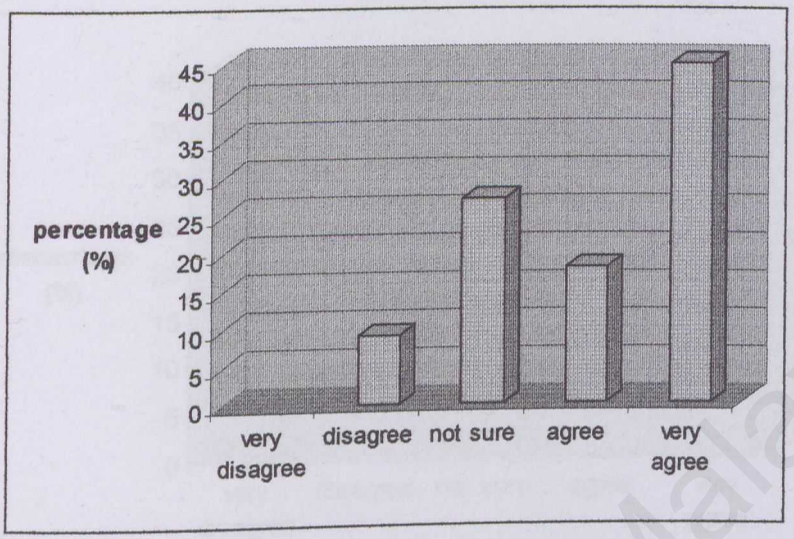


Figure 7.5 user friendliness of the system

To submit the response, touch screen event method is applied. All the respondents agreed with this method with 36% voted for agree and the other 64% voted strongly agree.

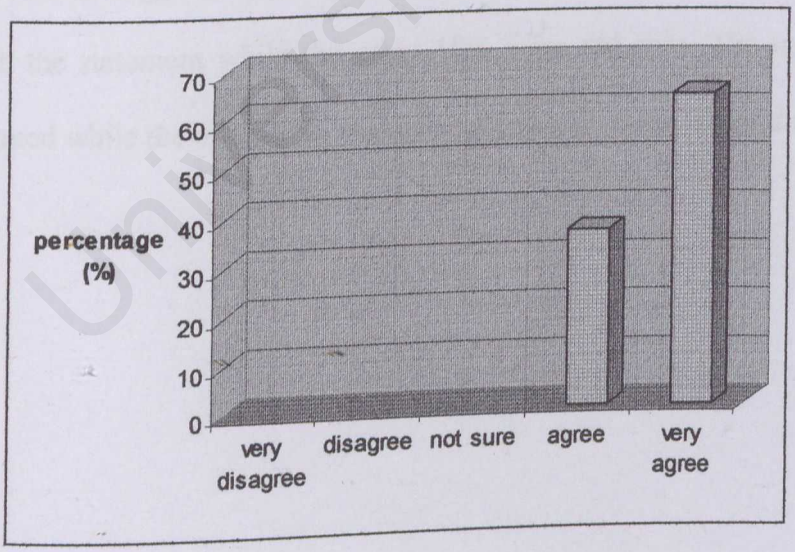


Figure 7.6 response submission methods

On the statement that there are errors on the solution, 27% of the respondents were strongly disagreed, 9% disagreed and 36% of the respondents selected the not sure option. However, 18% and 9% selected agree and strongly agree options, respectively.

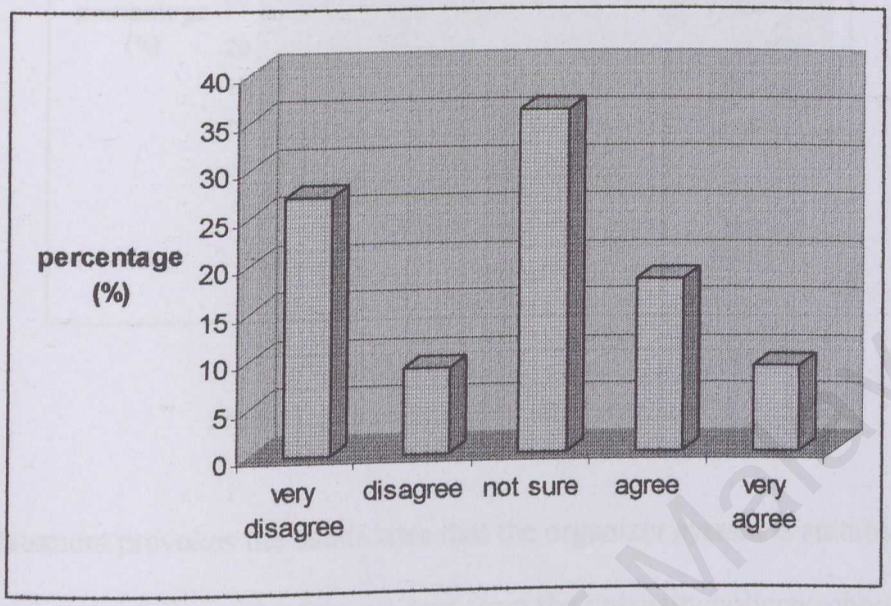


Figure 7.7 errors on the organizer system

The sixth statement suggests that organizer runtime is fast. 9% of the respondents disagreed with the statement while the other 18% were not sure. The next 27% of the respondent agreed while the other 45% strongly agreed with the statement on runtime.

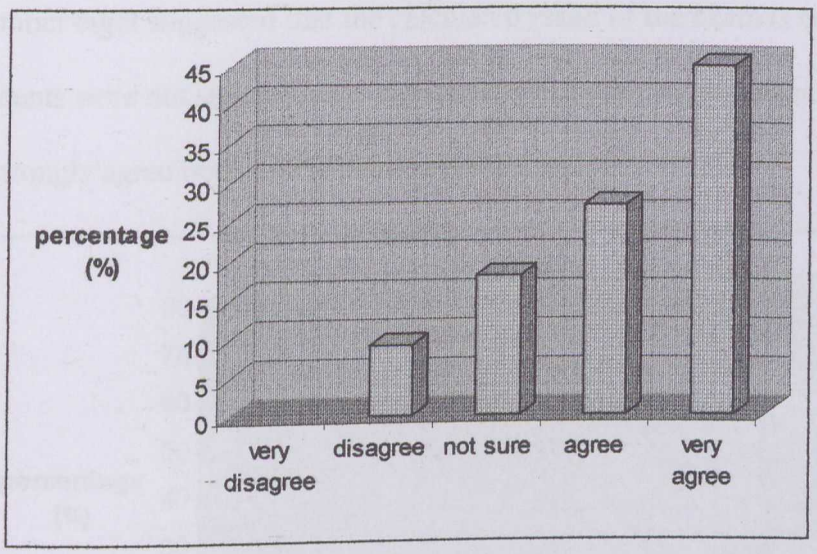


Figure 7.8 the organizer system runtime

The next statement provokes the candidates that the organizer system is suitable for the use of managing the daily work of the student from the univesity/college/school. 45% of hem strongly disagreed, 9% disagreed, 27% not sure while the other 9% were strongly agreed with the statement.

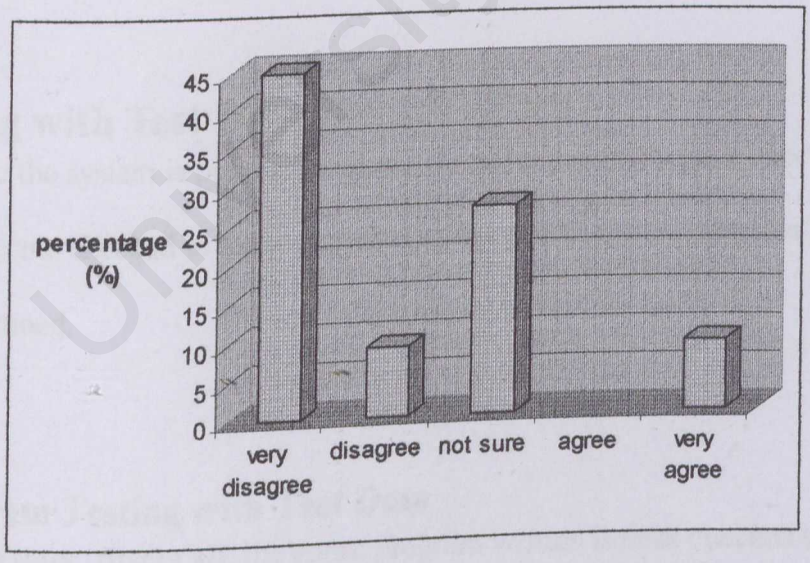


Figure 7.9 the suitable of organizer system for the student

Statement number eight suggested that the calculated result of the exam is correct. 18% of the respondents were not sure with the statement, 9% agreed while the next 73% selected the strongly agree option to support the statement.

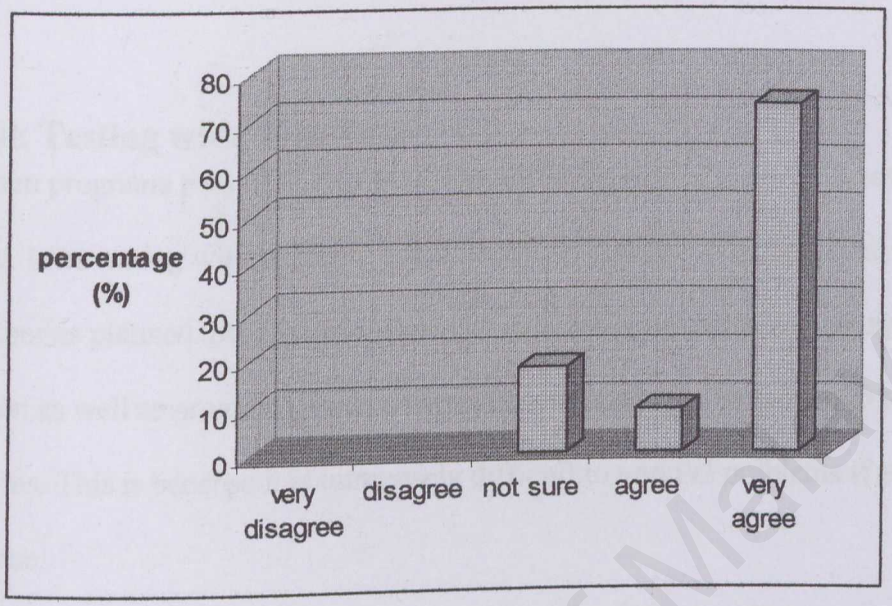


Figure 7.10 the correctness of calculated result of the exam

7.4 Testing with Test Data and Live Data

Before the system is put into production, all programs are desk-checked, checked with test data, and checked to make sure that all the modules work together with one another as planned.

7.4.1 Program Testing with Test Data

At this stage, first of all, the entire program written is desk checked to verify the way the system will work. Each step in the program is check to ensure the routine works as it is written. This is followed by both valid and invalid data test. These data are run to

see if base routines work and also to catch errors. Test data include possible maximum and minimum values, as well as possible variations in format and codes. Outputs from test data are carefully verified.

7.4.2 Link Testing with Test Data

When programs pass desk checking and checking with test data, it went through link testing. Link testing will checks to see if programs that are interdependent actually work together as planned. Small amounts of test data are designed to test the systems specification as well as program. It takes several passes through the system to test all combinations. This is because it is immensely difficult to unravel problems if everything is test at once.

Test data that are used cover variety of processing situations for link testing. First, tests are processed to see if the system can handle normal transactions. If the system works with normal transactions, then variations are added, including invalid data used to ensure that system can properly detect errors.

7.4.3 Full System Testing with Test Data

When link tests are satisfactorily concluded, the system as a complete entity is tested as well. Test data created for the express purpose of testing system objectives are used.

System testing includes reaffirming the quality standards for system performance that were set up when initial system specifications were made. Everyone involved in the

system once again agree on how to determine whether the system is doing what it is supposed to do. This will include measures of error, timeliness, ease of use, proper ordering of transactions, acceptable down time, understandable procedure manuals and others.

7.4.4 Full System Testing with Live Data

When system tests using test data prove satisfactory, the new system is tried with several passes on what is called as "live data" – data that have been successfully processed through the existing system. This allows an accurate comparison of the new system's output with what that is known to be correctly processed output, as well as a good feel of how actual data will be handled.

7.5 Negative Testing

A good source of negative testing is to conduct testing by forcing errors to occur based on an error-processing document. The following negative testing are had been used to test this system:

i. Invalid use of keystrokes, mouse, function keys and miscellaneous keyboard operations.

ii. Repeated operations between navigation buttons and tool bars.

iii. Invalid and valid interaction with windows, example – maximizing and minimizing screens, navigating from one application to another, executes product-exit to windows-return to product, etc.

iv. Invalid selections of menu selections and menu selection function keys.

v. Inappropriate use of the function or set of functions.

vi. Invalid data inputs (example – put alpha characters in a numeric field or combination or blanks, or invalid length).

vii. Insert more information in a field than allowed.

viii. Unplug the machine when in the middle of executing the application.

ix. Press other keys or attempt to do another operation while executing the application.

x. Decrease the amount of memory or system resources available for the application.

After the negative testing, we found that the first version PalmForce can execute most of the action without error. The coming version of PalmForce will try to cover the remaining faults.

7.6 Limited Performance Testing

Performance testing for PalmForce involves the testing of the product under stress, maximizing the load of the application or volume testing and timing the ability of product to handle capacity or load over a specific period of time. Example, this system will be tested by initially 3 person until finally 20 persons to make sure that the system can concurrently process the user's data or request. In other way, we also added many data into database and then testing the system to make sure that it can performance the request in a tolerance time.

7.7 Ad Hoc Testing

Ad hoc testing for PalmForce involves informal and undocumented testing of the product. We had tested it any way we wish. Pretend to be an unsophisticated user. Push buttons, navigate functions and menus without purpose. Attempt to break the system. In some cases informal test cases should be documented, if it makes a good test or the steps are required to duplicate a found defect.

7.8 Usability Testing

This type of testing involves the usability of the system or is the product designed well enough for human to use (human factors). This type of testing was use to determine if the system is user friendly. These types of problems are submitted as change requests and not defects. We must be tactful when trekking through this area, because egos can be at stake. This type of testing also involves testing the product, as the agent in the field may actually see it. We were primarily focus on meeting the functional requirements of the release and do a limited amount of usability testing.

7.9 White Box Testing

White Box testing is the type of testing that deals directly with the stricture of the code within a module or a code segment. There are basically six types of code coverage in white box testing.

7.9.1 Segment Coverage

Each and every segment of the node between control structures is supposed to execute at least once.

7.9.2 Branch Node Coverage

Each and every branch of every possible direction is taken at least once.

7.9.3 Compound Condition Coverage

When multiple conditional appear in the code, every possible combination is tested based on a truth table.

7.9.4 Basis Path Testing

Each independent path through the code is usually taken as predetermined order. When dependencies appears in the code, each path where dependency appears exists must be tested.

7.9.5 Data Flow Testing

In PalmForce testing, this approach is to uncover anomalies such as variables, which are used but not initialized and declared.

7.9.6 Loop Testing

This type of testing is related to testing single loop (WHILE, FOR LOOP), concatenated loops (sequence of loop) and nested loops (one or more loops within loops).

7.10 Black Box Testing

This type of testing involves testing functions of a module without knowing the logic structure of the code. It focuses on the most important aspects of a module in the term of how well the module meets its specification.

7.10.1 Error Guessing

This approach is similar to 'ad hoc testing' where tester will try any type of test cases which come across his/her mind or pre-planned test cases.

7.10.2 Boundary Testing

This type of testing involves the boundaries of equivalent classes where the coverage of test cases will involve inside the boundary, on the boundary and outside the boundary.

7.10.3 Module Interface Testing

In this type of testing, each value within the interface is assured as correct as they related to the modules that call them. This means that specific calls in the calling module are tested to see whether they are in the right sequence and at the right type.

7.11 Chapter Summary

Testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. Unit, integration and system testing has been carried out for PalmForce system. At the end of the testing phase, the system should be able to perform the tasks required and free of some errors.

Chapter 8
System Evaluation

8.1 System Evaluation

After having gone through the testing and implementation phase, system evaluation is the final phase of developing this system – PalmForce. In this phase, system evaluation involves determining the problems or difficulties which arise during and after the program coding phase, recognizing the system strengths and weaknesses, and finally draft out the system limitations and also its future enhancements. The following section will explain in details about the

i. Problem encountered and solutions
ii. System constraints and limitations
iii. System strengths
iv. Future enhancements
v. Knowledge and experience gained
vi. Review on goal

8.2 Problem Encountered and Solution

The following are the major problems encountered from the beginning of the project through the end of the system development process.

8.2.1 Scope Is Not Properly Defined

In the initial stage of development, several problems were encountered in specifying the scope of the system. The scope must be clearly defined before the coding can start. The solutions to solve the problems are through interviewing the potential users, checking the current available similar system and also having discussion with supervisor.

8.2.2 Problems in Tools and Language Selection

There are many types of system development tools available nowadays. Choosing the right tools and language are important because the appropriate tools and language would help to develop the system in a more efficient way. The solution taken including seeking advice from supervisor, discussion with course mate who develop similar system and also having some research and review on various tools and language.

8.2.3 Inexperienced In the Chosen Programming Language

Due to time constraint, the learning and developing process was done in parallel. Since there was no prior knowledge of programming in J2ME, there was an uncertainty on how to develop a PDAs organizer system using J2ME. Although having difficulty in the early stages, however choosing to program in J2ME proves to be a wise move as it is a very powerful technology to build a PDAs organizer system. Problems were solved through research on related material online and referring to some reference books. Discussion with friends using similar technology also helps to solve some difficulties.

8.2.4 Difficulties in Designing User Interface

Problems that faced during the early stage of development are lack of knowledge and experience of the real system flow and layout of standard user interface. Therefore, it is difficult in designing the most appropriate logic and user interface. By referring to many PDAs organizer system interface, it helps to design the user interface in a more presentable and attractive style.

8.2.5 Limited Knowledge about PalmForce

Limited knowledge about veterinary causes difficulties in developing the system. Problem solved by observing the daily operations of a PalmForce and also searching information via internet.

8.3 System Strengths

The system strengths are described as follow:

8.3.1 User Friendliness

As a PDAs organizer system, PalmForce shows some of the advantages in term of its usability. Consistent user interface are available in this system. PalmForce provides a standard interface appearance through the whole system. Besides, it has friendly GUI where all type of button is well defined. This is to ensure that the user can easily use the system without any briefing or with minimal training.

8.3.2 Ease of Getting Information

The system provides several of information such as lecturer, course, assignment, exam, class and homework information. User can get all these information by just a few mouse clicks.

8.3.3 System Transparency

System transparency refers to the condition where the users do not need to know about the structure, where the database resides, its database management system and anything relate to the system implementation. For instance, users do not need to know how to retrieve and insert records into database and how to update their information. All they need to do is to add data and then view the information.

8.3.4 Error checking

PalmForce provides error checking for the validation of the important required field and prompt user about the invalid input.

8.4 System Constraints

The system constraints are described as below:

8.4.1 Limited Functionality

Inventory control and reporting function is absence in the system. The system also lack of student co-curriculum activities function.

8.4.2 Only Support English As single Communication Language

The system will only use English as single communication language as English is the international language. Other languages are not included in the system.

8.4.3 Limited student Information

Due to time constraint, the information that student can organizer into the organizer system is limited to some category only. The information includes lecture, exam, course, assignment, library's book, classes and result information. Other information such as student co-curriculum is not included.

8.4.4 Not Having a Print out Function

There is no print out function available in PalmForce system as the development time doesn't allow us to spend more time to build those functions. So, if the user wants to view for the information, they have to view from the PDAs. The user cannot print the information out to view later.

8.5 Future Enhancement

Due to the limitation of this system, there are a few suggestions that may be useful to future enhancement of the PalmForce system. The suggestions are as below:

8.5.1 More Functionality Added

Extend the functionality of the system that helps in report and generate the PalmForce end of student's analysis and report.

8.5.2 Provide Print out Function

This will let the user to print out the information that the user wish to view later on so that they don't need to view those information in PDAs. They can view it on the printed paper, it provides more convenient to the user.

8.5.3 Provide Malay Version

As the system is aim at Malaysian Citizens, therefore besides English, providing another version of the national language – bahasa Malaysia version would be a good idea.

8.5.4 More Information Added

More information about the student should be added, not just limited to university or school activities. May be some other student's information that is useful can also be added to make the system more usable.

8.6 Knowledge and Experience Gained

Besides knowledge on technical aspects such as Windows XP Profesional, J2ME, there are also other valuable experiences gained from working on this project such as:

- Being exposed to the real system development environment especially dealing with users
- Learn how to manage a project as in time and resource
- Concept on how to integrate and fully utilize various technologies into developing system
- Experience on how to set up and configure various technologies to be able to serve as a live system.
- Learn to work independently
- Cultivated skills in writing documentations and reports
- Boost self-confidence, self-esteem and good communication skill

8.7 Reviews on Goals

There should be certain expectation and objective achieved at the final stage of the project.

8.7.1 Expectation Achieved

The system had fulfilled the expectation stated at the early stage of the project. All the basic foundation of the system was being designed and implemented. Moreover, the end product met the criteria such as user friendliness, reliability, manageability, expandability and so on.

8.7.2 Objective Achieved

The system created had fulfilled all the requirements stated in the early chapter, therefore, the objectives to establish the application had been achieved.

8.8 Chapter Summary

As a conclusion, this project was succeeded in achieving the objectives of developing a PDAs based organizer system. It also projected the main idea of general office environment as to promote a paperless environment with the routing of information through the workflow application.

Throughout the development of this project, a lot of precious knowledge on PDAs based programming was gained. This included the configuration and management of Windows XP Profesional, programming knowledge in J2ME as well as the techniques and concepts in implementing database in palm. This project has been a very useful experience which exposes the idea of research work to the developer

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Book

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http://www.palmsource.com/

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http://www.billday.com/j2me/

http://www.symbian.com/

http://www.palminfocenter.com/

http://homepages.enterprise.net/jmarshall/palmos/

http://www.flippinbits.com/palmdevfaq/

http://www.netmeister.org/palm/POSE/POSE-HOWTO.html

Appendix A

Research Question

How do students organize their school work and daily tasks in a well arranged and systematic way?

Questionnaire:

☐ Please tick in the relevant box

— Fill in with the appropriate answer

Section A

Category of student

☐ Secondary School

☐ Pre-University

☐ University/College/Institute

☐ Others. Please specify _____

1. How do you manage your daily tasks and homework as a student? (You may tick more than 1 answer)

☐ Special book

☐ PDA Organizer

☐ Computer

☐ Others. Please specify _____

2. Do you find any difficulties in managing daily tasks and homework with your existing system?

☐ Yes (If yes, please answer section B & proceed to section D)

☐ No (If no, please answer section C & proceed to section D)

Section B

3. In which category, do you find difficulties? (you may tick more than/answer)

☐ Scheduling

☐ Homework

☐ Assignment

☐ Others. Please specify _____

Section C

4. Does your existing system incorporate both information and management system?

☐ Yes

☐ No

Section D

5. Do you think that an educational organizer will be helpful for you as it include managing daily task and homework.

☐ Yes

☐ No

6. Which of the following tasks would you like the educational organizer to perform? (you may tick more than 1 answer)

☐ Information

☐ Management

☐ Others. Please specify _____

7. What type of information do you wish to store in the educational organizer? (you may tick more than 1 answer)

☐ Student / lecturer / teacher information

☐ Class timetable

☐ Academic Result

☐ Text / reference book information

☐ Student notes

☐ Project / assignment

☐ Meeting

☐ Others. Please specify _____

8. Would you like to use educational organizer if you have opportunity to have one?

☐ Yes

☐ No

This testing purpose is to get the perception of the student as a major user for the educational organizer about the usability and consistency of the developed system.

According to the scale below, please tick (/) in the space that has been given to the respondent to represent respondent's view to the criteria that have been prepared.

1	2	3	4	5
very disagree	disagree	not sure	agree	very agree

no	statement	1	2	3	4	5
1	Instruction given to use the organizer system is sufficient					
2	Method use to organize and manage the information is appropriate					
3	The organizer system is user-friendly					
4	Method use to submit response is practical					
5	There are errors on the organizer system					
6	The organizer system runtime is fast					
7	The organizer system is suitable for the use of managing the daily work of the student from the univesity/college/school					
8	The CGP, CGPA and the result of the exam is counted accurately					

Thank you for your cooperation

Appendix B

Introduction

PalmForce system is consists of four main organizers: financial, health, personal and educational. I am doing the educational organizer, therefore, this user manual is going to discuss only on the educational organizer. Basically, educational organizer is divided into two main modules – university/college and school. So, I will divided it into three chapter according to the modules.

Chapter one discuss about the general description about the PalmForce system and the main page of the PalmForce system.

Chapter two reviews on sub modules that are contain in the university/college module. These include the personal info, class/reference, exam/assignment and schedule sub module.

Chapter three reviews on sub modules that are contain in the school module. These include teacher, subject, class, homework and test sub module.

Each process or function is discussed in details and sequentially. This is to provide significant and effective guideline to all range of users. Figures are used to improve and expend user's comprehension.

Chapter 1 General Description of PalmForce System

When the user first gets into the system this is the main page that the user will see

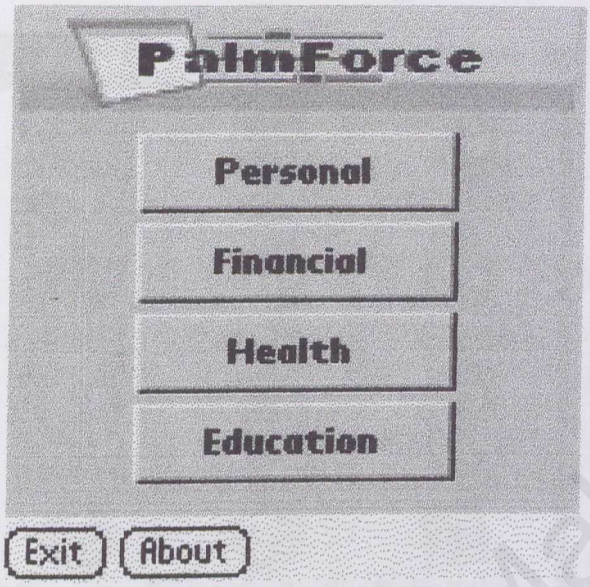

Figure 1.1 main page

If the user wish to know more about the PalmForce system, the user can click on the button at the bottom left corner. Then the user will able to see the screen below which explain what is the PalmForce system

Figure 1.2 about the PalmForce system

If the user wishes to exit the PalmForce system, they can just click on the exit. Then the user will able to exit to the desktop of the PDAs.

Figure 1.3 PDAs desktop screen

If the user wants to select the educational organizer, he just need to click on the button written the work "educational". Then the user will able to enter to this page.

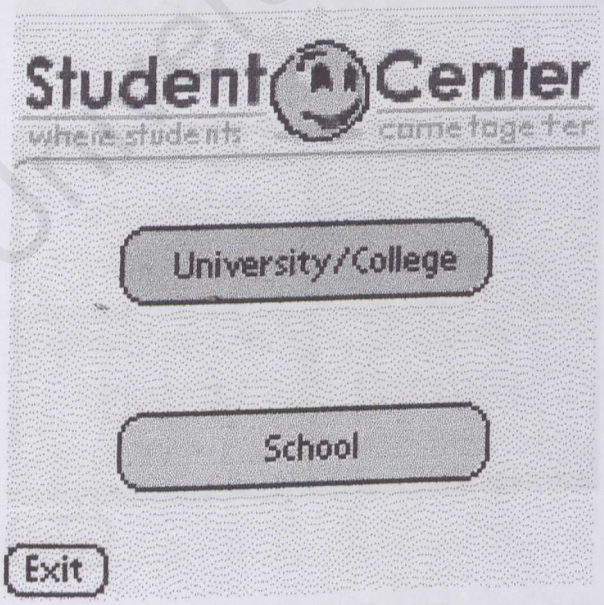

Figure 1.4 educational organizer

Chapter 2 University/College Module

In order for the user to get inside the university/college module, the user just needs to click on the button with words "university/college"

Figure 2.1 educational organizer

Then, the user will able to see another page for the university/college as shown below

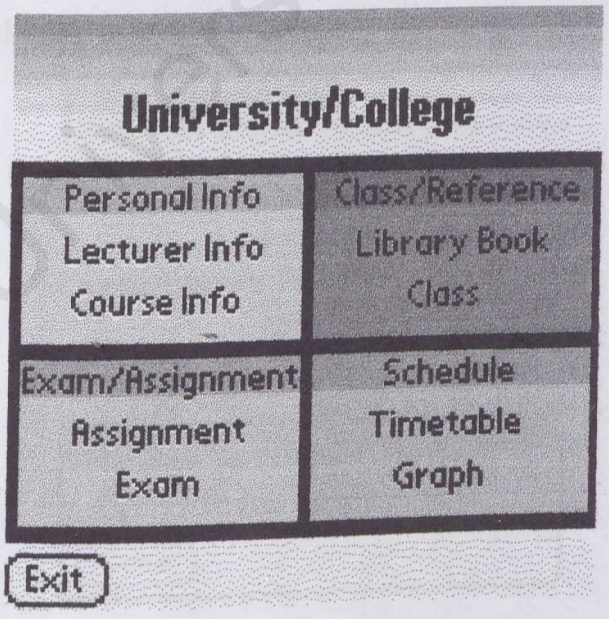

Figure 2.2 university/college module main page

First of all, the user needs to insert the information about the lecturer. In order to get inside the lecturer information adding page just click on the area written the word "lecturer info" then it will automatically get inside the page that is shown below

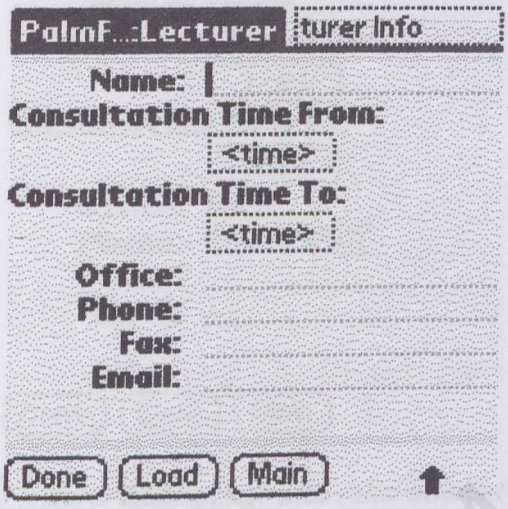

Figure 2.3 lecturer function adding page

There is a field validation checking in this page. If the user didn't enter any value in the field and then straightly click the done button, an alert message box will pop up to remind the user about the field that need to enter value.

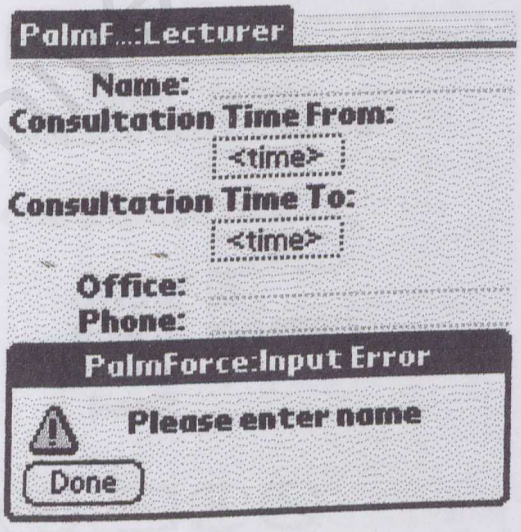

Figure 2.4 lecturer function adding page with message box

The user will fill in the value in the field that has been given. And the user will click on the done to store that information into the database.

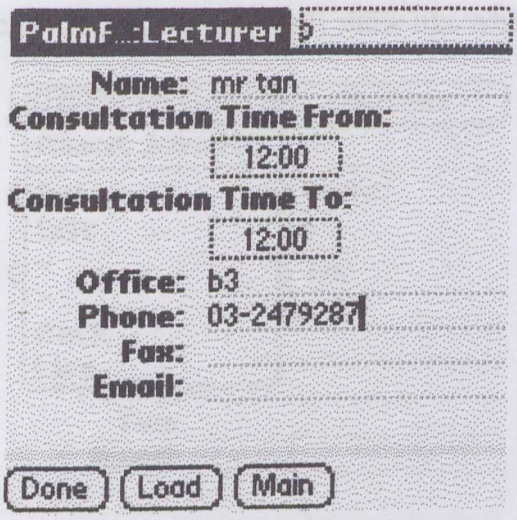

Figure 2.5 lecturer adding page with value inserted into field

The user will able to view the record that the user has been added before by clicking the load button to go to the page below. The user will able to view the next and previous record by clicking the ">" and "<" button. The user also can delete and edit the record by clicking the "Del" and "Edit" button.

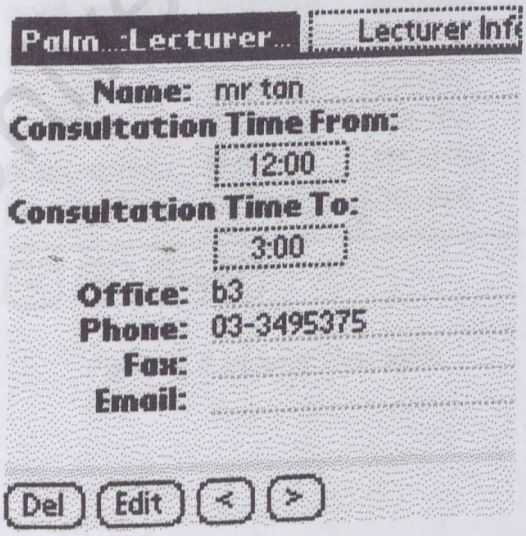

Figure 2.6 lecturer loading page

After that the user also can view the record in a listed table of record which provides a bigger picture for the user to check for the record. The user just has to click to the list button which is shown below. Then, the table will show like what you see in figure 2.8

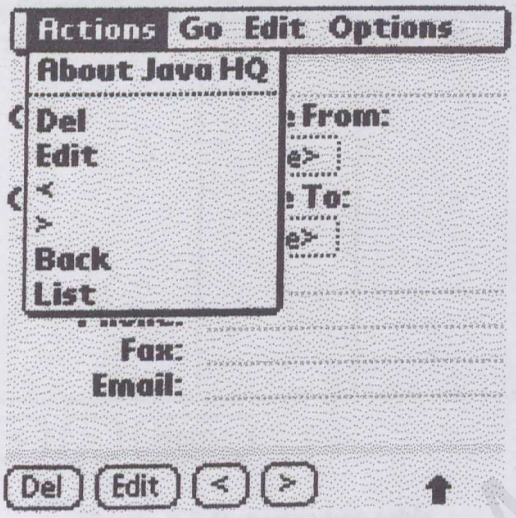

Figure 2.7 lecturer loading page

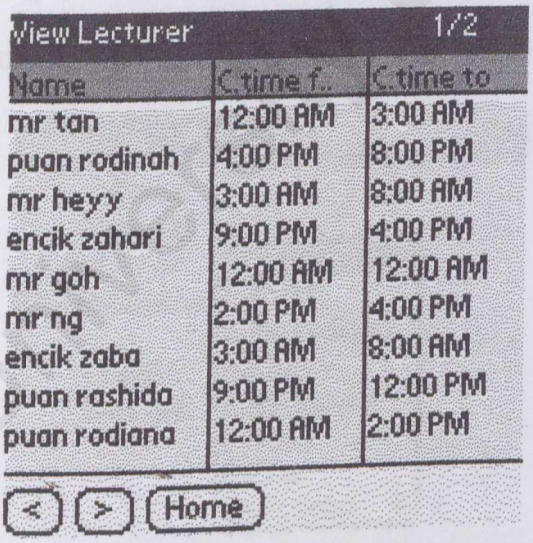

Figure 2.8 lecturer view table

If the record is more than 9, then the user can search for the next 9 records by clicking the ">" button which is shown below.

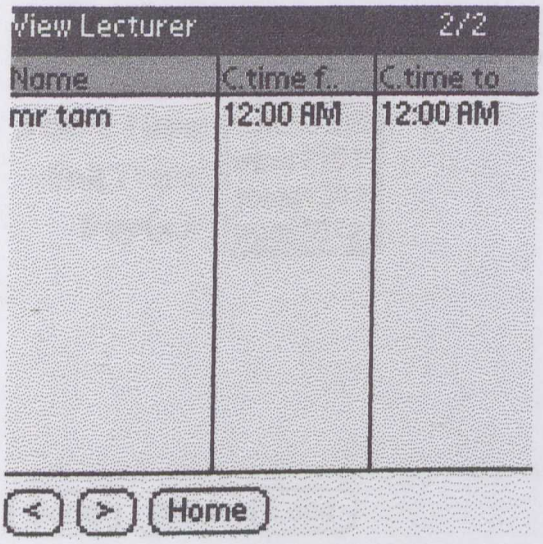

Figure 2.9 lecturer view table

After the user finish adding the lecturer information into the database, then only we shift to the course information to add the information about the course.

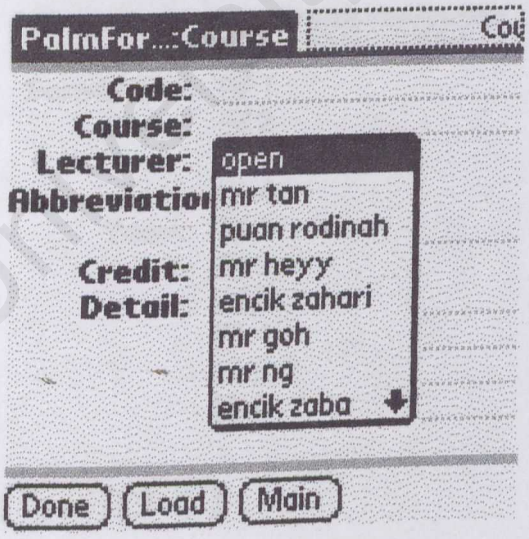

Figure 2.10 course adding page

After adding the course information, we will shift to the class information to add the class information.

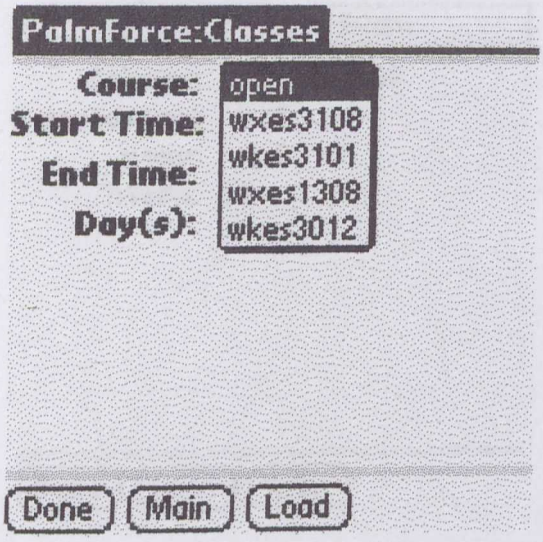

Figure 2.11 class adding page

Then, the user can open the exam page to add some result for certain course for certain semester and year. So, first the user needs to set the semester and year before go for adding the result.

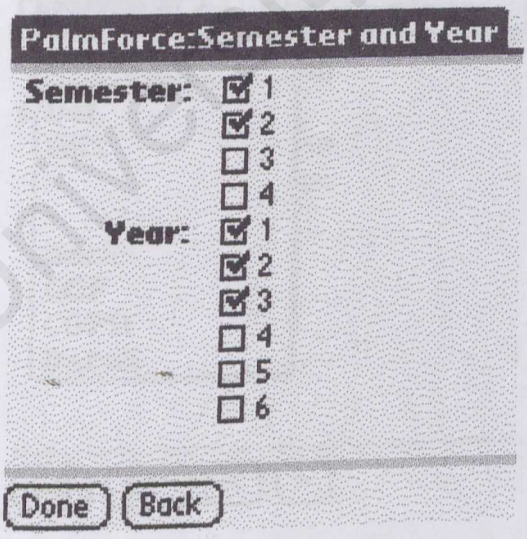

Figure 2.12 semester and year adding page

After adding the semester and year, now the user is ready to add the result according to the semester, year and course.

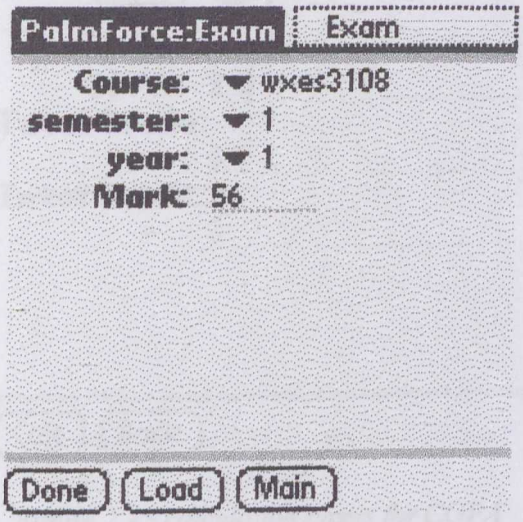

Figure 2.13 exam adding page

After adding several data into the database, we can calculate for the CGP and CGPA result. There are two type of calculation, one is CGP and the other one is CGPA.

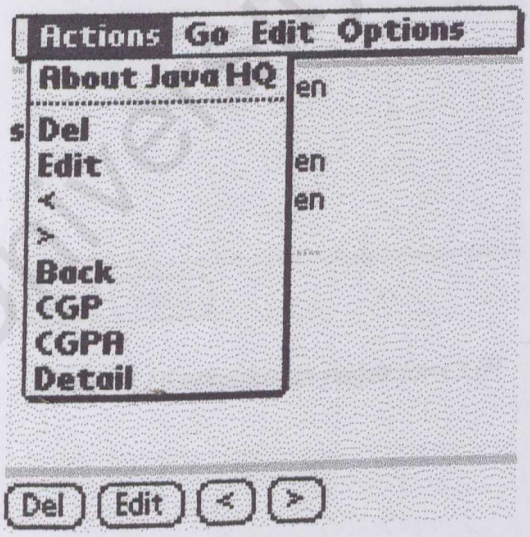

Figure 2.14 exam loading page

Two calculation of result are shown below.

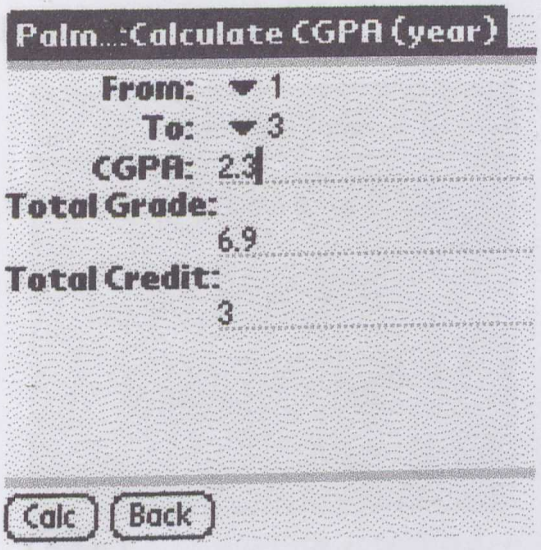

Figure 2.15 calculation pages for CGPA

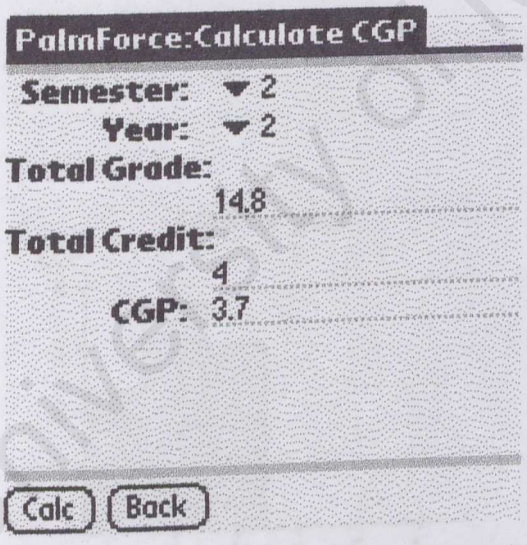

Figure 2.16 calculation pages for CGP

After that, the user can view the auto generated graph by going to the graph page. The screen shown below is the main graph page.

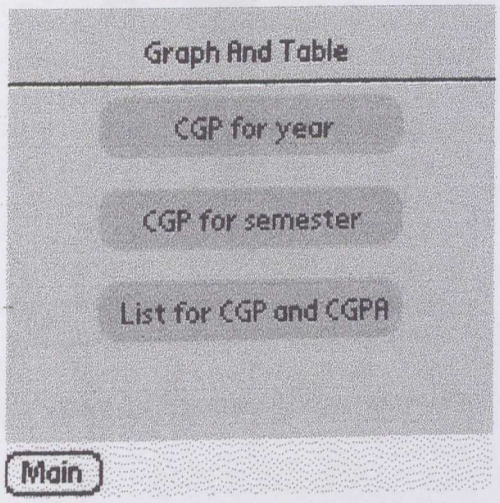

Figure 2.17 graph main page

Below are the two types of graph that user can view based on the result that user has been added into the database.

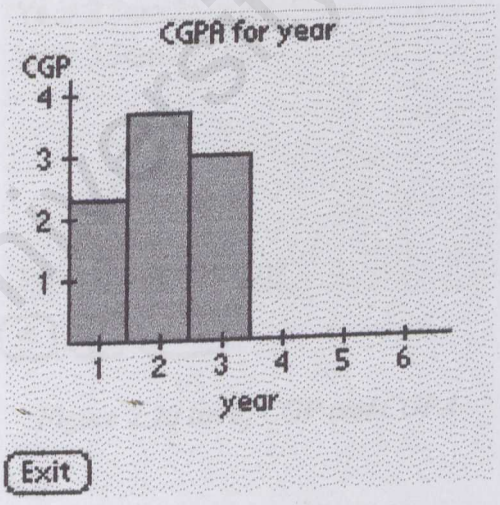

Figure 2.18 graph CGPA for year

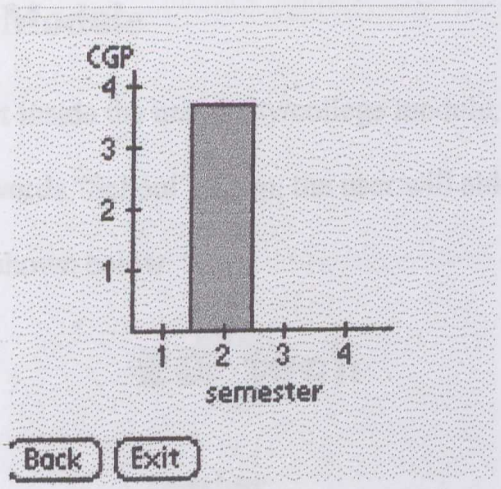

Figure 2.19 graph CGP for semester

Besides that, the user also can view the list of CGP and CGPA for every semester and year. The output may seem like the screen below.

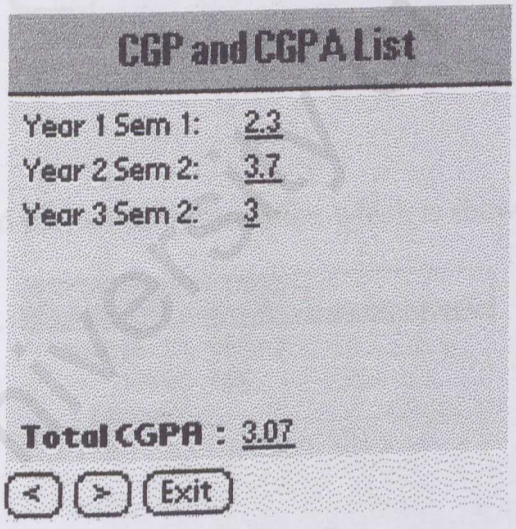

Figure 2.20 list of CGP and CGPA

Chapter 3 School Module

In order for the user to get inside the university/college module, the user just needs to click on the button with words "School". Then, the user will able to see another page for the university/college as shown below.

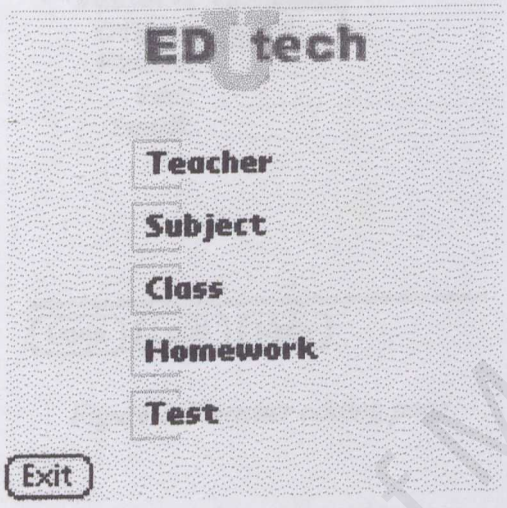

Figure 3.1 school module main pages

First the user needs to add the subject information which is shown below

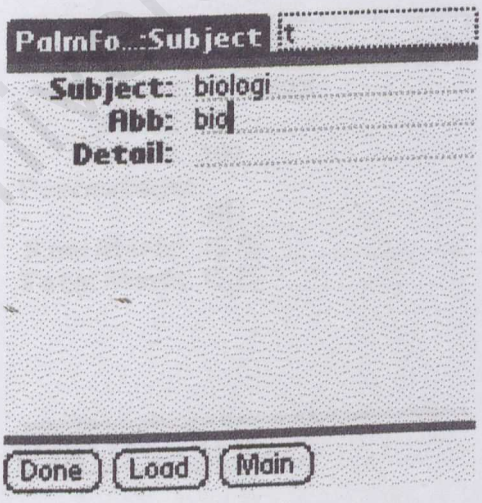

Figure 3.2 subject adding page

After adding the subject information into the database, then only the user can add the information about the teacher which requires user to choose the subject from the choice group.

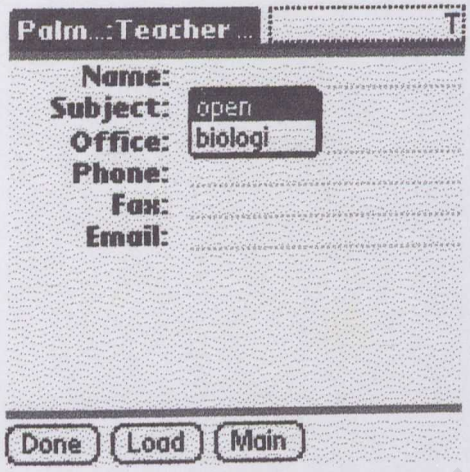

Figure 3.3 teacher adding page

Besides that, the user can calculate the mark for their subject by entering the required information just as shown below. Then the system will automatically calculate the real mark for certain subject.

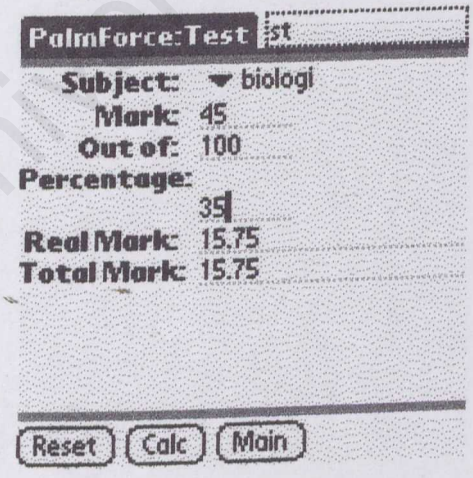

Figure 3.4 test calculating page